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FIRST ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH,

OF THE

STATE OF WISCONSIN,

FOR THE

Year Ending December 31, 1876.

N.Y. ACADEMY OF MEDICINE LIBRARY

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1876.

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JOHN FAVILL, M. D.,	MADISON.
SOLON MARKS, M. D.,	MILWAUKEE.
GEN. JAS. BINTLIFF,	JANESVILLE.
H. P. STRONG, M. D.,	BELOIT.
O. G. SELDEN, M. D.,	TOMAH.

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32544

LAW OF WISCONSIN

ESTABLISHING A

STATE BOARD OF HEALTH.

CHAPTER 366.

[Published March 31, 1876.]

AN ACT to establish a State Board of Health, to provide for the appointment of a Superintendent of Vital Statistics, and assign certain duties to local boards of health.

The people of the State of Wisconsin, represented in senate and assembly, do enact as follows:

Appointment of state board of health.

SECTION 1. The Governor, with the advice and consent of the senate, shall appoint seven persons, who shall constitute the State Board of Health and Vital Statistics. The persons so appointed shall hold their offices for seven years; *provided*, that the terms of office of the seven first appointed shall be so arranged that the term of one shall expire on the thirty-first day of January of each year, and the vacancies so created, as well as all vacancies occurring otherwise, shall be filled by the Governor, with the advice and consent of the senate; but any one may be re-appointed.

Duties of board of health.

SECTION 2. The State Board of Health shall have the general supervision of the interests of the health and life of the citizens of the state. They shall especially study the vital statistics of this state, and endeavor to make intelligent and profitable use of the collected records of death and sickness among the people. They shall make sanitary investigations and inquiries respecting the causes of disease, and especially of epidemics; the causes of mortality, and the effects of localities, employments, conditions, ingesta, habits and circumstances on the health of the people, and they shall gather such information in respect to those matters as they

may deem proper, for diffusion among the people. They shall, when required, or when they shall deem it best, advise officers of the government, or other boards within the state, in regard to the location, drainage, water-supply, disposal of excreta, heating and ventilation of any public institution or building. They shall from time to time recommend standard works on the subject of hygiene for the use of the schools of the state. They shall, in the month of January, make report to the legislature of their doings, investigations and discoveries during the year ending December thirty-first, with such suggestions as to legislative action as they may deem necessary.

Meetings of board and powers of same.

SECTION 3. The first meeting of the board shall be within ten days after its appointment, and thereafter in June and January in each year, and at such other times as the board or president of the board shall deem expedient. The meeting in January of each year shall be in Madison. A majority shall be a quorum. They shall choose one of their number to be president, and may adopt rules and by-laws subject to the provisions of this act. They shall have authority to send their secretary or a committee of the board to any part of the State when deemed necessary to investigate the cause of a special or unusual disease or mortality, or to inspect any public building.

Secretary of board and duties of same.

SECTION 4. The board shall elect a secretary, either from their own number or otherwise, but when elected he shall be a member of the board and its executive officer. He shall hold his office so long as he shall faithfully discharge the duties thereof, but may be removed for a just cause, at a regular meeting of the board, two-thirds of the members voting therefor. He shall perform the duties prescribed by this act, and such others as the board may require. He shall keep a record of the transactions of the board, shall have the custody of all books, papers, documents, and other property belonging to the board: he shall, so far as practicable, communicate with other state boards of health and with the local boards of health within this State; shall keep and file all reports received from such boards, and all correspondence appertaining to the business of this board. He shall aid, so far as possible, in obtaining contributions to the library and museum of the board. He shall prepare blank forms of returns, and such instructions as may be necessary and forward them to clerks of the several boards of health throughout the state. He shall collect information concerning vital statistics, knowledge respecting diseases, and all useful information on the subject of hygiene, and through an annual report, and otherwise, as the board may direct, shall disseminate such information among the people.

Salary and allowance of secretary.

SECTION 5. The secretary shall receive an annual salary, which shall be fixed by the State Board of Health; he shall also receive his necessary traveling expenses incurred in the performance of his official duties. The president of the board shall quarterly certify the amount due him, and on presentation of said certificate the secretary of state shall draw his warrant on the state treasurer for the amount. The other members of the board shall receive no compensation for their services, but their traveling and other necessary expenses while employed on the business of the board shall be paid.

Appropriation for expenses of board.

SECTION 6. The sum of three thousand dollars per annum, or so much thereof as may be deemed necessary by the State Board of Health, is hereby appropriated to pay the salary of the secretary, meet the contingent expenses of the office of the secretary, and the expenses of the board, and all costs for printing, which shall not exceed the sum hereby appropriated. Said expenses shall be certified and paid in the same manner as the salary of the secretary.

Health physician and clerks of local boards to report to state board.

SECTION 7. It shall be the duty of the health physician, and also of the clerk of the local board of health in each township, city and village in this State, at least once in a year, to report to the State Board of Health their proceedings, and such other facts required, on blanks, and in accordance with instructions received from the State Board. They shall also make especial reports whenever required to do so by the State Board of Health.

Duty of officers of state, physicians and others.

SECTION 8. In order to afford this board better advantages for obtaining knowledge important to be incorporated with that collected through special investigations, and other sources, it shall be the duty of all officers of the state, the physicians of all mining and incorporated companies, and the president or any agent of any company chartered, organized or transacting business under the laws of this state, so far as practicable to furnish the State Board of Health any information bearing upon public health, which may be requested by said board, for the purpose of enabling it better to perform its duties of collecting and distributing useful knowledge on this subject.

Secretary to be superintendent of vital statistics.

SECTION 9. The Secretary of the State Board of Health shall be the superintendent of vital statistics. Under the general direction of the Secretary of State, he shall collect these statistics, and prepare and publish the report required by law relating to births, marriages, and deaths.

Board to have charge of quarantine matters and general public health.

SECTION 10. The board shall have charge of all matters pertaining to quarantine, and shall have authority to make such rules and regulations as they may from

time to time deem necessary for the preservation or improvement of public health, and it shall be the duty of all police officers, sheriffs, constables, and all other officers and employes of the State, to enforce such rules and regulations, so far as they shall be intended to effect [affect] their respective duties.

Duties of officers of state.

SECTION 11. The Secretary of State shall provide a room suitable for the meetings of the Board, at Madison, and office room for its secretary.

Rooms to be provided for board and secretary.

SECTION 12. This act shall take effect upon its passage.

Approved March 13, 1876.

General Report of the Board.

STATE OF WISCONSIN,
OFFICE OF STATE BOARD OF HEALTH,
January 10, 1877.

To the Honorable, the Legislature of the State of Wisconsin:

In accordance with the provisions of the law under which the State Board of Health has been organized, its first annual report is herewith presented.

The progressive spirit of the present era manifests itself in no direction more beneficently than in its efforts for the prevention of disease and of premature death. Indeed one of the most marked characteristics of this age, is the advanced estimate which it places on the value of human life and the care which is taken for its preservation. Under improved sanatory conditions and surroundings, the plagues and pestilences which once swept the earth have mostly ceased to exist, and statistics of longevity establish the fact that the average duration of man's life has been materially lengthened.

Doubtless, a part of this bettered condition of mankind is due to the increased comforts that have accompanied the advance of civilization, but in a much larger measure it is due to the better observance of sanitary laws by individuals and by communities—to individual and to public hygiene. It has been chiefly left to this age to extend a knowledge of these laws to the people, to urge, and in some cases to enforce, an obedience to them, and so wonderful have been the resulting benefits, that we may be truly said to have entered upon "a new era in medicine"—"its highest and most beneficent development." Men have learned, and are learning, the grand fact which is the underlying principle in all sanitary labor, that "disease and death are in a great degree preventable." It is upon this foundation that the rapidly multiplying Boards of Health and Public Health Associations are builded. It is the effort of the

physician to cure, if possible, individual cases of disease. It is the labor of the sanitarian to prevent the very inception of disease. In this, his is the higher work, and it is also one which gives greater promise. Dealing largely with communities and with the influences affecting bodies of men in these efforts, their importance rises beyond that which seeks alone to cure the disease of the individual, and *preventive medicine* assumes a rank beyond the curative.

In all these labors for the physical good of man, it is not to be forgotten that other good is at the same time accomplished for "the same causes which promote physical disease and favor preventable mortality, foster also immorality, degredation and social misery. Uninhabitable habitations, over-crowded rooms, foul air, neglect of personal and public cleanliness, insufficient sanitary appliances, intemperance, uncontrolled habits of impurity; these are not only the factors of disease but they are also the factors of moral degredation." To eradicate these causes of disease and death is therefore to elevate man both morally and intellectually and to assist in his restoration to the likeness of his Maker.

It is not needful here to recapitulate what has been accomplished by State Health Boards since they were first organized in this country in the State of Massachusetts. It would be easy to show that they have proven here, as in England and elsewhere, of real and practical benefit—conservators of their best physical interests and a real blessing to the people of the several States where they are in operation. This has been so manifest indeed, that though less than eight years have elapsed since the inauguration of this movement in this country ten States have already adopted and put into practical operation the idea of STATE MEDICINE, which number will doubtless be considerably increased during the present winter. We believe that it would be easy to demonstrate the wisdom of these organizations not alone on the score of humanity but also on the score of the truest economy, for while there is "nothing so costly as sickness," neither is there anything which so much contributes either to the happiness, or to the wealth of a State as the health of its citizens. That "public health is public wealth has become a part of the inner consciousness of the people." It is not a hasty or unconsidered statement that we make when we assert that the pecuniary loss to a State from *preventable sickness*, annually exceeds its entire cost of govern-

ment; yet to build an argument in favor of an organization of this character, upon the cost of preventable sickness in *money*, is to build it upon the lowest and most unworthy ground. If by its investigations into the causes of disease, and its timely words of advice or of warning, it shall be able to save the life of a single citizen, then might a State consider itself repaid for the cost of its Health Board, and humanity might well demand this at its hands. Victories over disease are grand victories, and in the language of Dr. Baker, to those "who shall call forth and so marshal facts and generalize the scattered forces of knowledge as to lead to victory over any one of the causes of disease which now annually destroy our citizens by hundreds or by thousands, humanity may well accord a higher praise than to the most successful of warlike generals."

To enlighten the people concerning such causes; to instruct them that they may escape sickness and death from preventable diseases; to teach them "a better knowledge and observance of hygienic laws," is the legitimate work of a State Board of Health, and is included in the comprehensive term "State Medicine," which, with Dr. Bowditch, we understand to be "a special function of State authority by which it is bound to take care of the public health, to investigate the causes of epidemic and of other diseases, in order that each citizen may not only have as long a life as Nature would give him, but likewise as healthy a life as possible." Certainly "these objects rank among the most important matters discussed by the humanest hearts," and none "can be nobler or more deserving the attention of learned men, of philanthropists, or of statesmen."

"The primary object of public medicine," says Dr. Farr, "is to prevent disease; but it also surrounds the sick with conditions most favorable to recovery, and diminishes the death-roll of the people." And the same eminent authority, recognizing the difficulties that environ this labor, says: "Supposing every condition favorable for the most perfect operation of the powers of State Medicine, we should still see grave defects in many persons; shortcomings in others; in many, organic degeneracies; in many, criminal depravities." And he gives, as the closing thought of an able address: "How, out of the existing seed, to raise races of men to divine perfection is the final problem of public medicine."

Accepting these exalted views of State Medicine, and of the duties of a State Board of Health, the undersigned have entered upon the

duties imposed upon them by the commission of his Excellency the Governor, with a feeling of individual responsibility in view of the greatness of the work before them; with an earnest desire so to meet the varied duties and difficulties which will confront them as that their work will commend itself to the intelligent judgement of the people; and with the hope that they may so inaugurate this new and important department of public service, as to demonstrate its capacity for a usefulness which shall not be limited to the present time, but which will increase with the passage of years, and prove to be a blessing to the people of the State, lasting through all time.

In presenting this first annual report, the Board beg leave to say that they regard the work thus far done as largely of a preparatory nature. The time which has elapsed since its organization is much too limited for it to hope for the exhibition of any great results, yet they believe that some good preliminary work has been done, and that there has been awakened in the minds of many of the people a thoughtful interest in sanitary matters, which cannot fail to be productive of future good. It has been the object of the Board to enlist the interest and co-operation of thinking men, both within and without the medical profession. It has been its belief that thus they could best create and develop a public sentiment in favor of hygienic principles and practices. It is painfully evident that this must of necessity be a comparatively slow work—that a large majority of our fellow citizens are both ignorant and careless as regards many of the fundamental principles of hygiene, and that they live in daily and direct disobedience of many of the simplest laws of their physical being.

For the purpose of systematizing the labors of the Board, and of bringing before the people such useful knowledge as is contemplated by the law, each member of the Board has been charged with the special study of some branch of sanitary science, with the view of presenting the result of such investigations to the people. We present herewith the fruit of such labor in a series of papers, which are designed to convey such knowledge in a popular, rather than in a scientific manner, which papers we commend to your attention.

For a more formal and detailed report of the operations of the Board, we refer to the accompanying report of the Secretary.

SMALL POX AND ITS PROPHYLAXIS.

Of the reports herewith given, that of Dr. Griffinon Small Pox, will possess special interest from the fact that this disease has been, and now is, unusually prevalent and fatal in various places in the State. We commend its teachings to careful study. Small pox may be pointed to as at once the most amenable of all diseases to prevention, and the most destructive of all diseases when unmodified. Capable, as we believe, of being *utterly exterminated*, it has lost none of its virulence since the time when, during the single century preceding the discovery of vaccination, it caused the death of 45,000,000 of human beings on the continent of Europe. In the metropolis of this State during the last half of the year just closed, it caused the death of 162 persons, the mortality in one ward reaching in the month of November the frightful figures of 58½ per cent. of all cases. As might have been anticipated the health officer reports that the disease has prevailed almost wholly among those who *oppose* vaccination. We believe that properly applied and enforced, preventive measures might have saved these 162 lives, and the hundreds of other cases of sickness from this loathsome disease which occurred during the same period of time, with all their attendant burthens of woe, of sorrow, of interrupted labor and business, and of enormous expense, but such results can be accomplished only by aid of stringent laws making vaccination and revaccination compulsory. We believe that public opinion and a due regard on the part of the government for the welfare of the people, will in time demand this; but this Board is not now prepared to do more than call your attention to these facts, and to state that in its judgment, based both upon personal observation and extensive correspondence on the subject, much less than one-half of the population of the State are now protected against this dire scourge.

This subject has been deemed of sufficient importance in view of the prevalence of the disease, to call for the issue of a special circular of warning and instruction, which has been widely published in the newspapers of the State, and to some extent distributed to physicians.

SEWERAGE AND DRAINAGE.

The report of Dr. Marks on sewerage and drainage, touches a subject of vital importance to every community. The influence of

drainage upon health, is at the present time attracting very great attention among sanitarians, and it is clearly demonstrable that as the drainage of a district is perfect or imperfect, so certain forms of disease disappear or prevail. No water-soaked ground can ever be healthy, or fit for human habitation. Soil moisture is well known to be one of the prolific causes of the tubercular diseases which annually claim tens of thousands of victims. Dwellings otherwise excellent, are often erected in apparent utter thoughtlessness of the character of the soil on which they are built, or its capacity for drainage, where this should have been a primary consideration, and thus not infrequently there is laid, not only the foundations of a dwelling, but at the same time the foundation of a fever, or a consumption. Imperfect sewerage, where a system is established is also a fruitful cause of disease. The escape of sewage matter into our water-supplies, or the subtle emanations of sewer-gas into our dwellings are deadly poisons which sap the citadels of life without warning. The subject is a wide and a practical one.

CONSTRUCTION AND VENTILATION OF PUBLIC BUILDINGS.

Somewhat closely connected with the subject of sewerage and drainage is that of the Construction and Ventilation of Public Buildings, upon which a preliminary report is made by General Bintliff. This is also an extensive field for sanitary study intimately concerning us all, for however carefully we may construct our own dwellings none of us can escape the evil influences connected with the construction and ventilation of public buildings. This report touches more particularly upon the construction and ventilation of the school buildings in which so large a portion of the time of our children is spent, pointing out some radical defects which exist in them and which lie at the foundation of not a few of the diseases which tend to produce a race of invalids. While there are admitted difficulties attending the securing of a satisfactory system of ventilation, it is yet evident to every thoughtful observer that very many of the existing defects might be avoided, and that in the construction of our lofty school houses and in the general custom of sending to the uppermost rooms the advanced classes of girls who are just developing into womanhood, there is being practiced an evil against which there cannot be uttered too emphatic a remonstrance. We fully endorse and cordially recommend to

school officers and school architects the idea of lower school buildings with greater floor space to each scholar, and believe that all questions of architectural beauty should be made subordinate to the higher consideration of the health of our offspring.

MENTAL HYGIENE.

The subject of Mental Hygene treated by Dr. Favill is one upon which comparatively little has been written, yet one of very great interest and importance. How rightly to train and feed the expanding minds of our children, is a problem worthy our most careful attention; when, where and how, to teach them so as to develope their mental health and strength is a question upon which their future welfare in a great measure depends. The effects of popular methods of school education, the pernicious influence of self-reporting, and of prize systems, the demand of developed mental activity for food, the effect of bodily fatigue on the mind, and the influence of heredity, are some of the topics treated of in this paper. We call especial attention to the thought of the writer that Insanity is generally a consequence of *disuse* rather than of *overuse* of the brain, and that the occupations calling for most mental strength are the least likely to break down or to lead to insanity.

FOODS AND DOMESTIC BEVERAGES.

The paper of Dr. Selden, on "Foods," is the opening of a wide subject of practical daily application. The kinds of food, the methods of preparation, the time and manner of eating, the influence of certain kinds of food on the system, the reasons why certain articles of food can be used continuously while the relish for others is speedily lost, the absolute necessity for a suitable variety of food, the necessity of changing our hasty habits of eating, and of more thoroughly masticating our food, are among the things treated of in this paper on this most fruitful theme. There can be no question but that, as a people, we are in need to be constantly reminded of our "sins against the stomach," and that our food is to a great extent improperly selected, imperfectly prepared, and in general far too hastily, and often too frequently, eaten.

REGISTRATION.

We commend to your consideration the paper which has been kindly prepared, at our request, by Dr. Joseph Hobbins, of Madi-

son, in which is set forth some of the more prominent advantages of a registration of vital statistics. This subject is one which has engaged much of the thought of this Board, and effort is being made to give vitality to the existing law on this subject, which, though it has held a place on the statute boeks for many years, has been, so far as the recording of births and deaths is concerned, in most places practically a dead letter, and for all purposes of sanitary study absolutely valueless. This is evident from the fact that *two-thirds* of the counties make no return whatever of deaths, and more than one-half make no returns whatever of births. Marriages are reported more or less perfectly in every county of the State, with one exception.

Without registration we can know nothing accurately concerning the birth or death-rate, or the amount or character of prevailing diseases. Believing, as we do, that Wisconsin ranks among the most healthy States of the Union, our registration has been so imperfect that we have no figures to substantiate our belief, outside of the city of Milwaukee, which, "according to a table compiled by the Health Officer of the city of Brooklyn, in 1875, shows a smaller ratio of total mortality than any other city of its size in this country." It is eminently desirable that every State and every community should not only know, but exhibit its vital statistics, and that the healthfulness of locality should be largely a determining element regarding residence therein. From such an exhibit we believe that Wisconsin could not fail to be the gainer by emigration to it; thus a tabular statement in the last report of the Milwaukee Board of Health, compiled by the Health Officer of Brooklyn, showed the death rate from consumption in twenty-seven American cities, and places Milwaukee lowest in the list, with one exception; and from the same report we learn that, of sixty-two American cities, Milwaukee stands ninth, and, compared with fifty-seven foreign cities, it ranks fourth in low annual death rate. Should we exclude the infant mortality, which has been very high, Milwaukee would at once rank as among the healthiest cities in the world, and there can, we think, be no reasonable doubt but that the State at large could make an exhibit equally, if not more favorable.

In conclusion, we congratulate the people of the State upon the enlightened wisdom of her legislature, which by the inaugura-

tion of State Medicine, has shown this appreciative care of the highest interests of her citizens and placed herself abreast with the most advanced humanitarians.

We beg leave also to say that as the main object to be accomplished by the publication of the annual reports of this Board is the dissemination of the information they may contain among the people, for their education in matters pertaining to their health, such object may be largely defeated by the fact that the very limited number of copies of such reports placed at our disposal by existing laws, will prevent such liberal distribution of the same as we believe this object demands.

Very respectfully,

E. L. GRIFFIN,
JOHN FAVILL,
SOLON MARKS,
JAMES BINTLIFF,
J. T. REEVE,
H. P. STRONG,
O. G. SELDEN.

Secretary's Report.

OFFICE STATE BOARD OF HEALTH,
APPLETON, WIS., January, 4, 1876.

To the Board of Health and Vital Statistics of the State of Wisconsin:

GENTLEMEN—I have the honor to present to you briefly a connected history of the operations of this board since its organization.

In accordance with the provision of a law passed by the last Legislature and approved March 13, 1876, entitled "An act to establish a State Board of Health, to provide for the appointment of a Superintendent of Vital Statistics, and assign certain duties to Local Boards of Health," his Excellency the Governor commissioned the following named gentlemen as members of said Board, to-wit:

O. G. Selden, M. D., of Reedsburg, for one year, ending January 31, 1877.

H. P. Strong, M. D., of Beloit, for two year, ending January 31, 1878.

J. T. Reeve, M. D., of Appleton, for three years ending January 31, 1879.

Gen. James Bintliff, of Janesville, for four years, ending January 31, 1880.

Solon Marks, M. D., of Milwaukee, for five years, ending January 31, 1881.

John Favill, M. D., of Madison, for six years, ending January 31, 1882.

E. L. Griffin, M. D., of Fond du Lac, for seven years, ending January 31, 1883.

The board as thus constituted held its first meeting at the Capital in the city of Madison, June 27 and 28, 1876, at which time there were present, Gen. Bintliff, and Drs. Griffin, Favill, Marks, Reeve, and Selden. A temporary organization having been ef-

fected by the choice of of Gen. Bintliff as chairman, and Dr. Reeve as secretary, it was addressed by Dr. Griffin, the senior member of the board, setting forth the nature and importance of the work entrusted to it, as follows:

DR. GRIFFIN'S ADDRESS.

Gentlemen: Acting under instruction from our worthy Governor, we have met at this time to perfect our organization and enter at once upon the special work committed to this Board.

I shall not go amiss in your judgment, I think, if I briefly call your attention to some of the objects of the field of study and labor upon which we are now about to enter; for upon our right appreciation of the position we now take and the duties growing out of that position and our fidelity to those duties, will depend the usefulness of this organization to the State. We can hardly overestimate the importance of the work to which we now personally commit ourselves.

Through the enlightened judgment and liberal action of our Legislature, Wisconsin has inaugurated a movement that may be made capable of good to her citizens in all future time. No statute of the State embodies greater wisdom or touches a more vital interest of the people then the one under which we act. Impressed with the essential dignity of the offices we hold, while we distrust our own fitness for the work, I trust we shall be loyal to the truth and act wisely under the responsibilities which the law imposes.

It is a matter worthy of note that Wisconsin, comparatively a young State, has so early in the history of the study of "*State Medicine*," planted herself by the side of other States which have, by legal enactments, created State Boards of Health.

In June, 1869, Massachusetts, through the judicious and philanthropic efforts of a few good and true men, was the first to pass a law establishing a State Board of Health. The elaborate reports given to the State by the learned gentlemen who have served upon that board, upon various subjects vitally connected with the health and the lives of the citizens of the State, have greatly quickened thought and stimulated inquiry in every State of the Union, and in foreign countries, upon the great question of Public Hygiene.

In 1870, California, following the example of Massachusetts, established a State Board, which, by their faithful work and intelligent advice, have rendered important service to the State.

In 1872 Minnesota entered upon the same beneficent work. The able papers of Drs. Staples and Sempler, just given to the public in their Fourth Annual Report on the advantages of the climate of Minnesota to consumptives, are worth to the State many times the amount of the appropriation for the support of the Board.

In 1873 Michigan committed this work to some of her ablest and most philanthropic men. Their labors in the field of "*Preventative Medicine*" have already awakened a general interest and inquiry among the citizens of the State and led to such observance of hygienic measures as already to demonstrably diminish the death rate throughout the State.

Pennsylvania has agitated the subject and a bill creating a State Board, with the liberal appropriation of $8,000 was defeated by a small majority at the last session of her legislature. The medical profession in Indiana has also entrusted the work to a committee who are already at work creating a public interest in the measure.

When the law under which we now work was published, March 31, 1876, Wisconsin was the tenth State which had committed herself to this wise and humane service. Since that date the Territory of Colorado has organized a board, consisting of ten of her ablest men. We may safely predict that the day is not far distant when every State in the Union, in obedience to that advanced public sentiment which will regard *public sanitation* as the grandest and best gift a government can confer upon its citizens, will have a similar organization, working under laws so uniform as to secure great harmony and efficiency of action throughout the whole country.

I mention these facts to remind you that, although the field of labor into which we now enter is comparatively new, yet it is not entirely uncultivated. The labors and investigations of these various boards have brought out facts and suggestions that will be of the utmost importance to us in our work. The work in all the States, is essentially the same. If wisely performed, it will be far reaching in its results.

The second section of the law creating this board indicates somewhat clearly, in the general, the work we are to perform. An essential part of this work specifically, and as it grows out of special investigations of specific subjects, is to *educate the people of the State into a better knowledge the nature and causes of disease, and a better knowledge and observance of hygienic laws.* These laws are to be taught and in all practical ways enforced. The necessity of this work will be apparent when we reflect that a great majority of the physicians of the State—a class of persons who, by virtue of their office, are the conservators of the public health—have as yet given but little thought to the subject of preventive medicine, but accustom themselves to look upon the office and function of the physician as merely to recognize and cure disease.

Comparatively little instruction is given in the science of hygiene in our common schools or the higher institutions of learning in the State. There is need that it should form an essential part of the required study so soon as the pupil is of age to profit by such study; for a majority of such pupils, by necessity, leave school early, and are members of families to whom a knowledge of practical hygiene is very essential.

As "the sanitary care of its citizens is the first duty of the State," there should be established in our University, our Colleges and Normal Schools, a professorship of Physiology and Practical Hygiene, and no pupil should be considered qualified to go forth and teach who was not only well instructed tn the "facts, principles and dictates of sanitary science, but had also a proper appreciation of their value." The peeple need *facts*—facts fortified and made cogent by figures; facts demonstratable from persistent and ever active causes, and gathered from many localities. They need to be taught that *consumption* has its cause often in *soil moisture*, that the external cause of typhoid fever is an animal poison introduced into the system through infected water, or foul gasses emanating from decaying animal matter, and that the death of their dear ones, so often resignedly attributed to Divine Providence, is the

result of their own sin of neglect; the legitimate outcome of a neglected privy; an open cess-pool; a disgusting pig-sty; a contaminated well or a festering ground surface near the dwelling, which has been drinking in the kitchen slops for years, foul gases from which have been forced by moving currents of air into and through all the apartments of the home.

Another part of the duty of this board, indicated by the law is the "study of the vital statistics of the State, with a view to making intelligent and profitable use of the collected records of sickness and death among the people."

The successful study of sanitary science must always be based upon mortuary facts. These can only be obtained by aid of legal enactments which shall be compulsory to a degree that shall secure the necessary care and labor.

An intelligent author says: "One of the first great objects of sanitary organizations is to watch the death rate—to watch it not only over a city or parish, but in detail; to watch it in regard to difference of sex, age and circumstances; to watch it from month to month, and even from week to week; to watch it as affected by different diseases and particularly what are termed epidemic diseases, and such diseases as are believed to be preventable, and this done, to make known from time to time the results to those who are chiefly concerned in sanitary evils, so as to effectually bring home to the dwellers in darkness, ignorance and disease the immense significance of the facts taught by these figures."

It is evident this cannot be done without complete and accurate returns of mortuary facts from all parts of the State. Hence a primary duty will devolve upon this board, to carefully study defects of our registration laws with the view of such modification as may be necessary to secure intelligent and full registration returns from every town and city in the State.

It is further made the duty of this board to make sanitary investigations and inquiries respecting the causes of disease, and especially of epidemics; the causes of mortality, and the effects of localities, employments, conditions, ingesta, habits and circumstances on the health of the people." These themes are suggestive, stimulating, grand.

Let the public mind become enlightened as to the *nature* and *causation* of diseases and the means of their prevention, and let there be a corresponding thoughtfulness and care in the observance of preventive measures, and not only will the death rate throughout the State be materially lessened, but it will be demonstrated to every observing mind that *sanitary and economic science* are inseparable in a wise administration of civil government.

On the very threshold of the second century of our national life, Wisconsin inaugurates this movement—a movement which, in its *scope and aim*, is likely to be one of the grandest and most beneficent of any that shall command the thought and engage the services of the physician and philanthropist, as the decades of this century pass, not only in this State, but every State of the Union and on every continent.

To us is given the honor and upon us rests the responsibility of the initiatory work of the State. It is for us to make the work of this board "*popular with*, because *useful to* the people of the State."

After listening to this address the Board proceeded to ballot for permanent officers, which resulted in the election of Dr. E. L. Griffin, as President, and Dr. J. T. Reeve, as Secretary. The further sessions of the Board were largely consumed in general and free discussion of the topics set forth in the address of President Griffin, and in arranging plans of labor. The following is a brief statement of the results of such discussions, so far as the same took the form of resolution or adoption.

A committee composed of Gen. Bintliff and Drs. Marks and Selden was appointed to wait on His Excellency the Governor, to notify him that the Board was fully organized; to receive any communication he may have to make to it; and to invite his presence at any of its meetings.

A committee, of which Dr. Selden was chairman, was appointed to prepare rules or by-laws for the government of the Board, whose report after amendment was adopted. A copy of the same will form a part of this report.

The subject of Vital Statistics and the requirements of the registration law, being deemed of great importance, was discussed at much length. Not reaching any definite conclusions a special committee composed of the President and Secretary was appointed to report to the next meeting of the Board such plan as may seem best adapted to give vitality to the law, now so far as reports of births and deaths are concerned, practically a dead letter.

To systematize the labors of the members of the Board, the following list of subjects were adopted for examination and discussion, to wit:

1. Endemic, epidemic and contagious diseases.
2. Hygiene of schools, prisons and public buildings.
3. Sewerage and drainage.
4. Food, drinks and water supply.
5. Disposal of excreta and decomposing organic matter.
6. Poisons, and special sources of danger to health and life.
7. Influence of localities, employments and habits of the people on health.
8. Illuminating oils and explosives.
9. Ozone, and its relations to health and disease.
10. Ante-natal murder.
11. Mental hygiene.

12. Medical topography of Wisconsin.

13. Influence on health of forest trees and their removal; shade trees near dwellings, etc.

14. Construction and ventilation of public buildings and private houses.

In pursuance of rule six, work on the special subjects above adopted, was assigned by the President as follows:

On Construction and Ventilation of Public Buildings and Private Houses—Gen. Bintliff.

On Sewerage and Drainage—Dr. Marks.

On Foods, Drinks, and Water Supply—Dr. Selden.

On Illuminating Oils, and Explosives—Dr. Strong.

On Mental Hygiene—Dr. Favill.

On Endemic, Epidemic, and Contagious Diseases—Dr. Griffin.

The following committees were in like manner appointed:

On Finance—Drs. Selden, Favill, and Marks.

On Legislation—Gen. Bintliff, Drs. Favill, and Strong.

On Printing and Stationery—Drs. Reeve, Favill, and Griffin.

The following resolution was unanimously adopted:

WHEREAS, This Board is impressed with the difficulties that will surround it in the performance of its duties, and recognizes the assistance it may receive from the medical profession, from scientific men and from philanthropists; therefore,

Resolved, That we cordially invite correspondence on any subject coming within the scope of the labors of the Board, and that we will thankfully receive and respectfully consider all such suggestions as may be thus made to us.

After further discussion of the registration law, Dr. Marks was appointed a committee to report to the next meeting of the Board a system of nomenclature of diseases, for recommendation to physicians in making their mortuary reports.

It was also resolved to issue a circular letter to the press of the State soliciting its co-operation and support in the work of the Board, and Gen. Bintliff was appointed a committee to prepare such circular, to be submitted to the next meeting of the Board.

The board then adjourned to meet at the office of Dr. Marks in Milwaukee on the 11th of July at 4 o'clock P. M.

The second meeting of the Board was held, pursuant to adjournment, in the city of Milwaukee on the 11th, 12th and 13th days of

July, 1876, the entire Board being present. Much of the time of these sessions was consumed in discussing plans of labor, and the general character of the work of the Board.

The following reports were made:

The committee appointed to prepare a circular letter to the press of the State, soliciting its influence and co-operation, submitted a report, which was approved and adopted.

The committee on Nomenclature of Diseases presented two reports, the one arranged alphabetically, the other by classes of disease. After some considerable discussion as to the merits and defects of each plan, the alphabetical arrangement was decided upon for future use, but it was further decided for the present to make no public recommendation to physicians concerning their mortuary reports, other than that which is covered by the Registration Law and blanks.

The committee to whom was referred the duty of perfecting plans for carrying out the provisions of the Registration law most effectually, reported the draft of a circular to physicians, clergymen and others, which was approved. The committee further reported that there was much preliminary work to be done in securing complete lists of the names of those persons; in the preparation and distribution of blanks, and in the other needed efforts to secure all rightful influences favoring the faithful execution of the law, in all of which they reported the efficient co-operation of the Secretary of State, under whose general direction this work is required to be done. The importance of Registration was re-affirmed, and, on motion, the details of the work was recommitted to the President and Secretary.

The Secretary was directed to issue a circular to the medical profession with the view of securing information as to the general sanitary condition of the State, with special reference to the character of prevalent diseases and the local causes for such diseases, if any.

An additional rule concerning the manner of auditing bills was adopted and ordered to be incorporated with the by-laws.

The Board then adjourned to meet at the call of the President

A called meeting of the board was held at the Capital, on the 5th, 6th and 7th days of December, 1876, at which were present, Gen. Bintliff and Drs. Griffin, Favill, Marks, Reeve and Strong.

The time of these sessions was chiefly occupied by an examination of the reports and papers offered for publication, those approved for such purpose being as follows:

On Small-Pox and its Prophylaxis, by Dr. E. L. Griffin.

On Sewerage and Drainage, by Dr. S. Marks.

On Construction and Ventilation of Buildings, by Gen. Bintliff.

On Mental Hygiene, by Dr. J. Favill.

On Foods and Domestic Beverages, by Dr. O. G. Selden.

On Registration, by Dr. Joseph Hobbins.

In view of the prevalence of small-pox, and the prospect of a wide spread epidemic of this disease, the issue of a special circular of warning, and of direction for its prevention, was ordered to be distributed to the press of the State.

Vouchers for all expenditures of the board, numbering from one to thirty inclusive, were examined by the finance committee, reported upon favorably, and ordered approved, and additional expenditures covered by vouchers numbered from thirty-one to thirty-seven inclusive, were ordered.

During the sessions of the Board an informal meeting was held jointly with the State Board of Charities and Reform, in which the close relation of some of the labors of the two boards was recognized, a pleasant exchange of feeling was given, and kindly fraternal relations established.

At the conclusion of its sessions the Board adjourned until its annual meeting.

The rules which have been adopted by the Board are herewith presented; also, copies of all the circulars referred to, in the order of their issue with some additional information concerning them, and concerning other work of the Secretary's office.

Rules Adopted for the Government of the Wisconsin State Board of Health.

The Wisconsin State Board of Health adopts for its government the following rules, which are supplementary to the laws of the

State, entitled, "An act to establish a State Board of Health; to provide for the appointment of a Superintendent of Vital Statistics, and to assign certain duties to Local Boards of Health," approved March 13, 1876, which law forms the constitution of the Board.

SPECIAL RULES.

RULE 1. The January meeting of the Board shall be held to be the annual meeting for the election of officers.

Special meetings of the Board may be held at any time by direction of the President, or may be called by the Secretary at the request of three members. All meetings may be held at such time in the month as may be directed by vote of the Board, or by the officer calling the meeting; and all the meetings except the annual meeting may be held where directed in like manner.

If at any meeting a quorum be not present, any smaller number may adjourn from time to time.

RULE 2. Each member of the Board shall attend all of its meetings, when properly notified, and unless excused, shall faithfully perform any special duty imposed on him by the board, and shall in general, do all in his power to aid in furthering the objects and business of the Board.

RULE 3. The officers provided for in the Constitution are, a President and a Secretary. The President shall be elected annually. He shall preside at all meetings of the Board, and enforce usual parliamentary rules in conducting its business; and in addition to the duties defined in the Constitution, he shall, in general, perform all duties incident to the office, and shall continue to hold office and perform these duties until his successor is chosen. In his absence a temporary chairman shall be chosen.

RULE 4. The Secretary shall be a physician—shall be elected, hold office, and perform duties as defined in the Constitution. He shall also keep an accurate account of all receipts, whether of money or of property, and of all the expenditures of the Board. He shall keep his books and records subject to inspection by the Board, or any member thereof, and shall deliver all property of the Board to his successor in office.

RULE 5. All bills, including those for the traveling and other necessary expenses of the members while employed on the busi-

ness of the Board, shall be laid before the Board for approval, before they are presented for payment.

RULE 6. In addition to such special committees as may be directed by the Board, there shall be appointed annually, by the President, a committee on finance, a committee on legislation, and a committee on stationery and printing, to consist of three members each. The President shall also appoint annually each member of the Board, except the Secretary, a committee to report on some subject connected with sanitary science or preventive medicine.

RULE 7. No papers shall be published in the annual reports of this Board, except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and any paper, so ordered or approved, shall be published over the signature of the writer.

RULE 8. The order of business at the regular meeting of the Board shall be:

1. The reading of the minutes of any previous meeting not already approved.
2. Reports of Standing Committees.
3. Reports of Special Committees.
4. Miscellaneous business.
5. Adjournment.

RULE 9. These rules may be amended only at regular meetings of the Board, and by a vote of two thirds of the members present.

CIRCULAR NO. 1.

OFFICE OF THE STATE BOARD OF HEALTH,
Appleton, Wis., July 11, 1876.

SIR—Wisconsin is the tenth State of the Union that has instituted a State Board of Health and Vital Statistics. As stated by President Griffin, at the first meeting of the Board, an essential part of the work before us is to educate the people of the State into a better knowledge of the nature and causes of disease, and a better knowledge and observance of hygienic laws. The board is composed of gentlemen, principally of the medical profession, who are willing to devote their time and their talents, without compensation, to the accomplishment of this work. We are conscious, however, that we shall need all the help we can command, and recognizing the press as having become one of the most potent instrumentalities in giving direction to the public mind, the board, at its first session, appointed a committee to address a communication to the members of the press of the State, stating briefly the claims of a State Board of Health to public confidence, and asking their support

and co-operation in the philanthropic work which the law has imposed upon us. History has proven that the protection of life and property, providing means for the education of all the people, and enforcing the observance of sanitary rules in the administration of society, are among the duties which individuals, as such, are incapable of successfully performing. The primal law of self-preservation has, therefore, impelled mankind to class these among the duties which the State owes to the people.

It is admitted that the laws providing for the collection of Vital Statistics in this State are inoperative, in consequence of the neglect of physicians, of ministers of the gospel, of local officers of various kinds, who, under penalty, are charged with certain duties necessary to the collection of statistics of marriages, births and deaths. As a basis of intelligent action we require the moral support necessary to secure a faithful discharge of the duties which these laws enjoin. The suggestions and deductions to be gathered from these returns, accurately made, are necessary before we can avail ourselves of studies upon the topography, meterology and geology of the several parts of the State and of the relations which conditions local and general, bear to disease. In our cities, special causes which affect the health and shorten the lives of the people are continually arising which need investigation and it may be, the intervention of authority for their removal. School houses and other public buildings, and many dwelling houses, are insufficiently ventilated. Lack of proper ventilation is a prolific source of disease. These are but a tithe of the subjects bearing directly upon the public health and requiring patient study and investigation which already have been presented to us. As we progress we feel confident the field of labor will expand before us. We seek aid in every direction. May we not look to you for such support as the results of our labors and the merits of the cause in which we are engaged may seem to you to justify?

E. L. GRIFFIN, M. D., Fond du Lac,
JOHN FAVILL, M. D., Madison,
SOLON MARKS, M. D., Milwaukee,
JAMES BINTLIFF, Janesville,
J. T. REEVE, M. D., Appleton.
H. P. STRONG, M. D., Beloit,
O. G. SELDEN, M. D., Reedsburg,
State Board of Health.

Circular number one, an address of the Board to the press, was issued in July last, and a copy sent to the editor of every newspaper in the State. It is hoped that by this means there has been awakened in this most powerful agent some degree of interest in the objects of the Board, and that the press will contribute its influence in the furtherance of its benevolent efforts.

CIRCULAR NO. 2.

OFFICE OF THE STATE BOARD OF HEALTH,
Appleton, Wisconsin, August 1876.

DEAR SIR:—This Board is desirous of securing information in reference to such diseases as may be prevalent in different parts of the State, both to put themselves into possession of a knowledge of the general health of the State, and for use if desireable in the first annual report of the Board. In selecting you as one of its correspondents, it is hoped that you will have the kindness to answer the following inquiries;

1. Has there been in your locality a notable increase, or decrease, either of sickness or of death from all causes, for the year ending September 1, 1876, as compared with previous years?

2. Have any diseases been especially prevalent in your locality during the past year?

3. If so, please name such diseases in the order of their prevalence, stating the type of each, whether mild or severe?

4. Can you discover any causes for the prevalence of these diseases?

5. If you can, do you believe that such causes are in any degree preventable or removable? And if so, how?

6. Have any diseases been attended with unusual fatality? If so name them and give your opinion of the cause of this fatality.

7. Please give as nearly as possible the number of cases of any endemic, epidemic or contagious diseases, and especially state whether there have been any cases of small-pox. How many? Had these cases been previously vaccinated? What was the result (death or recovery)?

8. Give your opinion as to the proportion of the inhabitants of the locality included in your report, who are thoroughly protected against an attack of Small-Pox by vaccination, and re-vaccination (½, ⅓, ¼)?

9. Can you suggest any method of improving the general sanitary condition of your locality.

10. Please state what diseases, if any, have been prevalent among animals and to what extent?

11. Have you a local Health Officer and an organized Health Board which takes cognizance of local causes of disease? If so please give name and address of Health Officer.

12. Please state as accurately as possible what diseases are prevailing at the date of making your report, and what their type.

Please define the locality for which your report is made, its most prominent features, and the number, proportion of foreign population, and general occupation of its inhabitants, with such other information concerning it, as you may be able to give.

You are particularly and earnestly requested *whenever* any contagious disease or disease of severe and fatal type shall appear in your locality, to report such fact at once to this office, with all possible items of interest therewith connected.

The Board while desiring explicit answers to the above questions, will, if you are unable to give such answers positively, be glad of your opinion (stated as such) on any of the questions, and any additional information you may be pleased to give concerning sources or removable causes of disease, will be thankfully received and used with discretion, and the name of the writer and the locality referred to, omitted from our report if so requested.

In your reply to these questions it will not be necessary to repeat them, but simply to refer to them by number.

Please let your report be understood to cover the year ending September 1, 1876, and all replies should be mailed to this office (in enclosed stamped envelope) by September 20th.

By direction of the Wisconsin State Board of Health.

Very respectfully,

J. T. REEVE, M. D.,
Secretary.

Circular number 2, a special circular of inquiry was issued in the month of August, and sent to something more than 200 physicians, embracing nearly every county in the State. Replies have been received from 57 physicians, to all of whom the thanks of the Board are due. These replies cover more than half the counties, and from them there has been obtained much information concerning the general health of the State, and many valuable suggestions concerning removable or preventable causes of disease. It is particularly gratifying to note the cordial manner in which the objects

of the Board are commended, and the assurance of active co-operation with it. Many of these letters speak of the desirability of establishing local boards of health—boards which shall have not only a legal existence, but which shall have vitality, and be efficient co-workers with this Board, in the effort to secure for every man and every locality the best sanitary surroundings which it is possible for it to attain. While it is true that responses were received from less than one third of those addressed, I regard this experience as justifying the belief that an ample and energetic corps of correspondents can be secured. An analysis of these papers shows that while there have been extensive epidemics of small-pox, scarlet fever, measles, whooping cough, and diphtheria, yet there has on the whole, been a very general decrease of sickness, and of death as compared with former years.

The entire correspondence, which is in possession of the Board, gives much material for profitable study, and contributes materially to our knowledge of the sanitary condition of the State. But it may not be amiss here more particularly to call your attention by short extracts from a few of these reports to the opinions of these correspondents concerning the need of, and benefits which may result from, sanitary improvements:

Boscobel.—The sanitary condition of this locality might be improved by thoroughly policeing the streets and alleys, caring for drains and cess-pools, and suppressing the sale of unwholesome food, such as unripe and decayed vegetables.

Oconto.—Sanitary condition improvable by a system of sewerage, of which there is none. Dwelling houses are low, badly ventilated, and over crowded, and inhabitants suffer from diseases resulting from such causes of filth.

Beloit.—Typhoid fever and dysentery of severe type have prevailed here. Believe it to be from low state of water in streams and ponds, and preventable by regulating use of water at dams.

Green Bay.—The sewerage of this city is bad—there is almost none. Most of the city is built on flat land, which has a surface of alluvium varying from two to ten feet, and a substratum of clay from eighty to one hundred feet in depth. This alluvium is rapidly becoming saturated with filth, when the city will experience the dire effects of sanitary neglect.

Milwaukee.—The sanitary condition of this place can be made

better by improving our system of sewerage. At this time most of the sewers in the city discharge their contents into an almost currentless stream, converting it into a cesspool from which large quantities of malarial poison emanate.

Omro.—This town is situated on a sluggish stream with low banks. Malarial fevers abound. We are supplied with pure fountain water, but drainage is very imperfect and the surplus water from the fountains finds its way to the river under stables, outhouses, and through other impurities, impregnating the air by its evaporation.

Chippewa Falls.—Want of cleanliness with slops and refuse, improper food, and stagnant water, have been productive of disease which might have been prevented by sewerage, and by draining and filling the low places, which are now receptacles of malaria.

New London.—Among other sources of disease, the defective arrangements of water closets and slaughter houses are prominent. The overflow of rivers filling low places with stagnant water has caused Intermittent and Remitting fevers.

Geneva.—A large number of cases of malarial fever, of severe type, have been caused by stagnant water in marshes, a majority of which could be drained.

Portage.—Dredging, in river and canal improvements, has exposed much decaying vegetable matter, causing intermittent fevers to an unusual extent. The sanitary condition could be improved by greater cleanliness. In many cases, privies are only a few feet from wells, the soil being a light sandy earth.

Ft. Atkinson.—The drainage of marshes would improve the sanitary condition of this locality.

Neosho.—Better drainage of marshes, and more attention to the personal cleanliness of the people would decrease the amount of sickness.

Elroy.—I attribute the prevalence of malarial fevers here to exposures on cranberry marshes.

Mazomanie.—Drainage badly neglected, and drinking water selected with too little care.

Richland Centre.—Drainage of cellars neglected.

Kilbourne City.—Present supply of drinking water is chiefly from cisterns. Good, soft water obtainable by boring into sand rock. Better drainage and greater cleanliness will lessen sickness.

Other quotations of similar character might be made to a considerably greater extent, but the above will be sufficient to show that there are abundant sources of disease which are preventable, and to indicate some of the channels of labor for this Board. Several of the correspondents make other valuable suggestions which cannot be here given; but I quote from Dr. Gott, of Viroqua, in answer to question No. 5 of the above circular, as covering perhaps more fully than any other single letter, points which are referred to in several:

Diseases are preventable "to a greater degree than is generally supposed:

1. By the appointment of local boards of health in every city and township throughout the State, composed of competent physicians residing therein, in lieu of the town board of supervisors; such board to be required to report quarterly, or oftener, to the State Board in respect to the sanitary condition of their respective localities.

2. The State Board to recommend the more thorough and systematic study of the sciences of physiology and hygiene in the schools of all grades than at present prevails.

3. To institute measures with the view to prevent the alarming prevalence of the crime of ante-natal murder, both in the ranks of the profession and outside of it; and lastly, to recommend to the profession of the State to do all in its power to educate the masses of the people in matters that pertain to their physical well-being by means of popular lectures from the rostrum, through the press, and by means of tracts. Let the profession once teach the people how to eat, how to sleep, how to work—in fact, how to live—and many of the diseases that flesh is now heir to will ultimately disappear."

Another correspondent refers to the contamination of drinking water by the percolation of the contents of privies, and gives illustrative cases of so much interest and importance that I quote at length from his letter as follows:

MUKWANAGO, *October* 27, 1876.

J. T. Reeve M. D., Secretary State Board of Health.

DEAR SIR:—* * * * The family of Mr.———, consisting of a housekeeper and two children, a girl about eight and a boy about ten years of age,

and whose home was in this town upon a farm with high rolling land and a dry soil, were stricken with disease under circumstances which I will detail below.

The housekeeper had suffered from epileptic fits during the spring and summer of 1874, for which I had been frequently called to see her. In using water to prepare her medicines, I discovered that it both tasted and smelled badly, and warned the family against using it for drinking or cooking purposes, but I afterwards learned that my advice was not heeded.

At the time I made some inquiry and examination of the premises, there was an old privy situated about two rods from the well over a whole scooped out of the earth to quite a depth, and completely filled with human excreta in all stages of decomposition, which had the appearance of having been undisturbed for years. At the same time the soil was a loose, sandy one, well calculated for the percolation of any matter in a fluid form. I could discover nothing about the premises that could change the water of the well but the privy. The well had furnished water for the house many years, and the occupants had always been in usual health.

In September, 1874, I was from home about three weeks. When I returned I was sent for, to visit the family. On my arrival at the house I learned that the housekeeper had been taken sick with a fever and had died some days before, and that the little girl had been taken sick two weeks previous to my visit, and was then, to all appearances, beyond hope of recovery; the boy was taken to all appearances as the others had been, and was very sick for a month, but finally recovered. The father was also taken about the time the girl died, and lived only about ten days.

While the housekeeper and little girl were sick, a girl of a neighbor's went into the house to help take care of them, was there a week, went home, and in two weeks was taken sick with a similar fever and was sick about three weeks, but recovered

Not long after I settled in this country, I learned that many of the wells filled with surface water, and I soon discovered the cause.

There are frequent depressions, or hollows, in the surface of the ground in this section of the State, generally but a few rods apart, frequently quite deep and without any outlet except by percolation.

I discovered that the water did not accumulate in such depressions much, except when the earth was frozen, preventing its escape through the soil, and by examining the lowest portions of them I found a thin layer of loose vegetable soil and then a stratum of sand, more or less thick, which extended frequently for a long distance. In this way surface water finds its way into wells many rods distant, and I have often seen it colored like the water in the bottom of such depressions, and have colored the water in them myself and found that it made its way directly into wells through a stratum of sand beneath and between strata of clay, which seemed very impervious to water.

Yours truly,
H. A. YOUMANS, M. D.

And still another correspondent gives a series of cases of fevers clearly traceable to the contamination of water supplies, fortifying his opinion by chemical analysis. I quote this part of his communication entire, as the subject is one demanding our most careful attention:

NEW CASSEL, *November* 2, 1876.

To the Secretary of the State Board of Health.

* * * * My observations in reference to the causation of Typhoid fever, have extended over a period of twenty-five years. I believe in its production of local causes, as I have frequently observed a marked connection between this disease and filthy unventilated places of living and sleeping; the exhalations from privies, cess-pools, pig-sties, foul-cellars, etc., and the continued use of water con-

taminated with sewage matter. Many cases have come under my observation, that in my opinion, were originated by breathing air contaminated with filth; yet I have concluded that in this, the southeastern part of Fond du Lac county, the disease is more frequently produced by drinking water made impure by the decomposition of organic matters. The chief water supply in this locality is from wells; a few families using spring water, and I will here remark, that I have no knowledge of their ever having been sick with typhoid fever.

Many of the wells have become foul by being so situated as to receive the washings from barn yards, pig-styes, privies, cess-pools, sinks, or the soluble filth from the loose soil. A few have wooden tubs in the bottom to keep out quicksand. When the water is low, so that the tubs are not covered, various fungi form upon them and contaminate the water.

Open wells are occasionally made foul by the Gordius, (Hair Snakes,) their presence evidently being due to grass-hoppers and crickets of which they are a parasite.

In the fall of 1870 typhoid fever appeared in Osceola, in a family of six. All had the disease, two died. The water used by the family was from a well so situated as to be surrounded with the drainage from the barn yard. In the winter of 1874, typhoid fever appeared among the children attending a small district school in the town of Ashford. Twelve including the teacher had the disease; all recovered. The water used in the school room was from a shallow well near a marsh and barn yard. The fever appeared simultaneously in a family of seven using water from this well, five having the disease and recovering.

In the fall of 1874 typhoid fever appeared in a family of five, residing in the town of Osceola. Three had the disease, and one, the head of the family, died. The water used was from a well eighteen feet in depth, sunk through a soil the first six feet of which was composed of sand, gravel and marle, all below being sand, and walled with well-tile placed on a timber curb. This well was at the bottom of a sag twenty feet below the surrounding surface; and after every heavy rain was surrounded with the drainage from a barnyard that occupied one side of the sag. Late in the fall of 1874 all manures and filth were removed from the barnyard, and it was not again used until the winter of 1875, and this accounts for the exemption of the family, residing on the premises, from the disease during the summer and fall of 1875. The spring and summer of 1876 having been "a wet season," an unusual amount of drainage surrounded the well, and the family of three using the water were all taken sick with typhoid fever in the month of August—one died.

I sent a quart of water from this well to Dr. Griffin, who forwarded it to Dr. Kedzie, Professor of Chemistry in the Agricultural College, Lansing, Michigan, and member of the Michigan State Board of Health, for analysis; and he has kindly sent me Dr. Kedzie's letter (which I enclose), giving the result of his examination.

Other instances similar to these have come under my observation; but the limits of this paper compel me to reserve them for a future report.

* * * *

Very respectfully,

S. L. MARSTON, M. D.

Enclosed in the above communication, was the following letter from Dr. Kedzie:

LANSING, MICH., *October* 31, 1876.

E. L. Griffin, M. *D.:*

DEAR DOCTOR—Your favor of the 20th inst. was received in due course, and in a few days the bottle of water from Osceola. At your request I have given it as careful examination as the small quantity of water would permit.

The water contains 33 grains of solid matter in the imperial gallon (10 pounds), of which 11 grains are organic and volatile matter and 22 grains consist of carbonates of lime and magnesia, chloride of sodium, oxide of iron, silica, etc. On heating the solid residue it blackened and gave off a repulsive odor. On distilling the water with carbonate of sodium and testing the distillate, I found the original water to contain 1.4 grains of ammonia to the imperial gallon. On again distilling with permanganate of potassium and hydrate of potassium, I found 1.05 grains of albuminoid ammonia. These nitrogenous compounds are usually reckoned at so many

parts in 1,000,000 of water. Estimated in this form there are 20 parts of ammonia and 15 parts of albuminoid ammonia in 1,000,000 water.

Tested by Heisch's test, this water shows decided evidence of sewage contamination, as it turns milky or opalescent from development of microscopic forms of life. Tried by Price's test, it gives a strong reaction for nitrous acid. Tried by all these tests, it shows a very impure water, such as might readily give rise to low forms of fever to those who are predisposed thereto, if used for any length of time. It unquestionably contains sewage matter.

Very respectfully,

R. C. KEDZIE,
Member of Michigan State Board of Health.

The causation of disease by the impurity of water in wells and other sources of water supply, so clearly shown by these correspondents, is also referred to in more general terms by several others, and unfortunately it is not always the case that water thus contaminated and containing the seeds of death, exhibits either by color, taste or odor, its deleterious qualities.

CIRCULAR NO. 3.

OFFICE OF STATE BOARD OF HEALTH,
APPLETON, WIS., *October*, 1876.

To the Medical Profession of the State of Wisconsin:

GENTLEMEN: By enactment of a law by the last Legislature, authorizing a State Board of Health and Vital Statistics, and by the subsequent appointment of the undersigned as such board, there has been imposed upon us a work of great magnitude, and, if rightly performed, one of immense importance to the people of this State. Recognizing this fact, we realize that this work cannot be done efficiently or even creditably without your assistance. From you must of necessity come the record of facts transpiring in your practice or under your observation, which as isolated facts may possess no public interest, but which collected, analyzed and elaborated by an organized central board, will give a mass of information from which may be deduced facts of surpassing value and interest both to science and humanity. We believe that you fully appreciate the importance of this undertaking, and that we can appeal with confidence to you individually as members of a profession which has ever shown itself foremost in all works of philanthropy and labors of science. We therefore ask you for that support, that co-operation, and that *personal interest* in this enterprise which will, in itself, be a guarantee of its success.

In planning the work given us to do, we foresee the necessity for frequent appeals to you for information and for counsel; but in the preparation of the circulars or other documents which from time to time it may be necessary for us to issue for the collection of facts or of statistics, this Board will always endeavor to consult your convenience, and to ask of you as little labor as may be consistent with a due regard for the objects sought to be obtained, and we trust that you will in return respond to these requests with such faithfulness and accuracy as will give value to every report made by you. We appeal to you also for an observance, as careful and complete as possible, of the Registration Law of the State. This law requires of you returns of the Births and Deaths which may occur in your practice, and from clergymen, justices and others, returns of the marriages solemnized by them. The collection of these records, forming the Vital Statistics of the State, lies at the very foundation of the successful study of Sanitary Science.

It is admitted that to make these returns will require labor and care on your part, but we believe that you will recognize the value of such statistics, and the fact that

the importance of the object to be gained demands from each one of you whatever of sacrifice it may cost you. This labor, however, will not be great. Carefully prepared blanks on which to make these returns, will be furnished you in such quantity as you may need, without cost, on application to the Register of Deeds of your several counties. We would recommend that you habitually carry with you in your daily practice a supply of these blanks to be filled as occasion may require, where the necessary information can be most readily obtained; and we would further suggest that duplicates of your returns kept on these same blanks, suitably bound or stitched together, will make such a "book" as will meet the requirements of the law, the value of which, increasing with each additional entry, will be at once apparent to you. This method will have the further advantage of obviating all question of expense, except the single possible one of postage, where you may find it more convenient to make your returns to the Register by mail.

It is desirable that these returns be made as complete as possible, but we will be glad to believe that no case of birth or of death occurs in your practice without some return of the same being made even though you may be compelled to make the report a meagre and incomplete one, remembering that while all the items connected with the returns are deemed of importance—some for legal and some for sanitary purposes—yet of all the items, the single fact that there has been a birth or a death, is much the most important one. In this connection, we further ask your influence in securing these returns from parents or friends in all cases where no physician is in attendance, the law making this work obligatory upon them as well as upon you, and under the same penalties. In all these efforts we feel assured that you will have the assistance and cordial good will of the people of your several communities.

We cannot close this letter without a word of congratulation at the forward step which has been taken by our State in the inauguration of this beneficent enterprise. Labored for by some of the foremost men of our profession through many years, for no personal ends, but purely in the interests of science and of humanity, it is cause for rejoicing that their efforts have been successful, and that Wisconsin has thus been placed by the side of her sister States in this exalted work of State or Preventive Medicine. The grand success of these older organizations is before us as an example and a stimulus. They have demonstrated their eminent usefulness, and have abundantly shown that "Sanitary and Economic Science are inseparable in a wise administration of civil government." The results are such that, it may safely be predicted, that the day is not far distant when public sanitation will be recognized as one of the most valued factors in every State government. That this movement just inaugurated in Wisconsin is eventually to become a great blessing to the citizens of the State, we entertain not the slightest doubt. What its immediate benefit may be will depend in large measure upon the faithfulness of the medical profession to the trust imposed on it. In this we are co-workers, and upon your cordial and faithful co-operation with us, does the success of this enterprise largely rest. We confidently expect such co-operation, and we invite from you the most free correspondence at all times, and on any subject connected with our work, assuring you that we will ever welcome and thoughtfully consider any suggestions you may make.

Very respectfully,

E. L. GRIFFIN, M. D.,
JOHN FAVILL, M. D.,
SOLON MARKS, M. D.,
GEN. JAMES BINTLIFF,
J. T. REEVE, M. D.,
H. P. STRONG, M. D.,
O. G. SELDEN, M. D.,
State Board of Health.

CIRCULAR No. 3.—The address of the Board to the Medical Profession was originally prepared with reference to circulation among physicians only, with the hope of enlisting their personal interest and co-operation in the work of the Board. It was subsequently determined to send it also to clergymen and justices of the peace. In order to make this distribution as complete as possible, much

preliminary work has been done in securing complete and correct lists of names, which necessitated a delay in the distribution so that this could not be made until the month of November. To secure such lists, a circular was prepared and sent to every postmaster in the State asking for complete lists of physicians, clergymen, and justices of the peace receiving mail at each office. There have thus been secured lists which it is believed could have been obtained in no other way, and to each address thus obtained there has been sent a copy of the circular in question, with appropriate specimens of registration blanks.

In this circular a special appeal is made for an observance of the Registration Law, and at the same time there was issued a circular from the Secretary of State, calling attention to the law as follows:

STATE OF WISCONSIN, SECRETARY'S OFFICE,
MADISON, *November* 1, 1876.

To Physicians, Clergymen, Justices of the Peace, and others concerned:

The recent passage of a law providing for a State Board of Health, and the entrance of that Board upon its duties, which include a study of the vital statistics of the State, seem to make it an appropriate time at which to call your attention to the provisions of Chapter 110 of the Revised Statutes, and amendatory acts, which provide for the collection of such statistics.

These acts require that Physicians shall make a report or return to the Register of Deeds of their respective counties, of all births or deaths occurring in their practice, and in like mannnr require a report from Clergymen, Justices and others, of all marriages solemnized by them.

It is the purpose of the law to obtain by means of these returns such records as will be of the highest value, both for sanitary and legal purposes, and it is hoped that you will so appreciate the importance of these objects as to render faithful compliance with its provisions.

Blanks on which to make these returns have been prepared by this office and distributed to the Registers of the several counties, from whom you can at any time obtain a sufficient supply, without cost. On these blanks, a sample of which is herewith sent, will be found extracts from the law, which fully explain the duties to be performed thereunder.

As the value of these reports depends to a great extent upon their completeness, you will please fill every blank where it is possible to do so, and also see that names of persons are written plainly and spelled correctly.

Very respectfully,

PETER DOYLE,
Secretary of State.

It is interesting to note here the fact, that although the registration law has existed on the statute books for several years, and applies alike to physicians, and to clergymen and others who perform the marriage ceremony, with similar penalties for non-observance,

yet in the measure of compliance with its provisions there has been a wide difference which does not appear to the credit of physicians. The last report of the Secretary of State shows that returns of marriages more or less complete have been made in all of the counties of the State, with one exception, while thirty-six counties make no report whatever of births, and forty counties make no returns whatever of deaths. Practically, it will be seen that with the exception of the city of Milwaukee (where returns have been made under municipal laws), these reports are for all purposes of sanitary study absolutely valueless. It is hoped, however, that the efforts which are being made by the Board and by the Secretary of State will meet with that cordial response which the importance of this subject demands, and that there will be no necessity for an enforcement of the penalties of the law.

I present in this connection copies of the registration blanks which have been prepared, and which may be found for free distribution at the offices of the several county registers.

MARRIAGE CERTIFICATE.

[*To be returned to the Register of Deeds by the person officiating.*]

1. The Color.*
2. Full name of husband.
3. Full name of wife previous to marriage.
4. Occupation of husband.
5. Residence of husband.
6. Birthplace of husband.
7. The place, town or township, and county, where the marriage was contracted.
8. Time when marriage was contracted.
9. By what ceremony contracted.
10. Names of subscribing witnesses.
11. Date of certificate of marriage.
12. Name of the father of husband.
13. Name of the mother of husband.
14. Name of father of wife.
15. Name of the mother of wife.
16. Any additional circumstances.

I hereby certify that the foregoing marriage was solemnized by me on the day above named, and that the above is a correct return of said marriage, and of the other facts there recorded.

Dated at ———, ———Co., on the —— day of ——— A. D. 187—.

Name, ———.

Title of officer or person performing ceremony ———.

Residence ———, ——— Co., Wisconsin.

* State the color so distinctly that the race may also be understood, as white, black, mulatto, Indian, mixed white and Indian, etc.

CHAPTER 110—REVISED STATUTES.

* * * * * * * * * * * * * *

SECTION 3. It shall be the duty of every clergyman, justice of the peace, clerk, and any other person or society, by or before whom any marriage may hereafter be

solemnized or contracted, to make out at once a record of the same, in a book to be kept for that purpose, and within thirty days after such marriage to return the same in the form of a certificate, duly signed by the person so certifying, to the register of the county in which said marriage shall be solemnized or contracted; which said record or certificate shall set forth, so far as the same can be ascertained, the full name of the husband, his occupation, and the name of his place of birth and residence; the full name of the wife previous to the said marriage; the name of the parents of said husband, and of the parents of said wife; also the color of the parties, and the time, place where and ceremony by which such marriage was contracted; and if pronounced by any clergyman or other person, as aforesaid, the place of residence of such person.

* * * * * * * * * * * * * *

SECTION 15. Any clergyman, justice of the peace, physician, or other person, who shall neglect to comply with the provisions of sections 2, 3, 4 and 12, of this chapter, shall forfeit for such neglect, a sum not less than fifty nor more than one hundred dollars.

* * * * * * * * * * * * *

REGISTRATION OF BIRTHS.

[*To be returned to the Register of Deeds of the county in which the birth occurs.*]

1. Full name of child (if named).
2. Sex.
3. Color, (*a*)
4. Names of other issue living.
5. Full name of father.
6. Occupation of father.
7. Name of mother previous to marriage.
8. Hour, day of week, month and year of birth.
9. Place, town or township, and county in which born.
10. Nativity of father.
11. Nativity of mother.
12. Any additional circumstances.

I hereby certify, That the above is a true return of the birth and other facts above recorded.

Dated at ———, ——— Co., }
Wisconsin, this —— day of ——— 187— } ..... (*b*) Attending Physician.
Residence,.....

NOTE.—(*a*) State the color so distinctly that the race may also be understood, as white, black, mulatto, Indian, mixed white and Indian, etc. (*b*) Strike out these words if the return be made by some other person, and add other explanatory words. An illegitimate birth or a "still-birth" should be so specified.

CHAPTER 110—REVISED STATUTES.

* * * * * * * * * * * * * *

SECTION 3. It shall be the duty of every physician, under whose care a birth shall hereafter take place, to make at once a record of such birth in a book to be kept for the purpose, and to return the same duly signed by him, or in the form of a certificate, to the register of deeds of the county in which such birth shall have taken place, in the manner and within the period directed by the preceding section; which said record and certificate shall set forth, as far as the same can be ascertained, the full name of such child, if any name should have been conferred, its sex, color, names of any other child or children living, the full name as well as the occupation of its parents, and, for better identification, the full name previous to marriage of the mother of such child, the day, hour, and the place in and at which such birth occurred. In case such birth shall have occurred without the superintendence of any person, and should no physician or other person be in attendance upon the parent immediately thereafter, it shall then become the duty of the parent or parents of such child to return the same to the register in the manner, form, and within the period above required.

SECTION 15. Any clergyman, justice of the peace, physician, or other person, who shall neglect to comply with the provisions of Sections 2, 3, 4 and 12, of this chapter, shall forfeit for such neglect a sum not less than fifty nor more than one hundred dollars.

REGISTRATION OF DEATHS.

[*To be returned to the Register of Deeds of the county in which the death occurs.*]

1. Full name of deceased.
2. Color (*a*)
3. Sex.
4. Age, (last birthday.)
5. Name of father of deceased.
6. Name of mother of deceased.
7. Occupation.
8. Place of birth.
9. Name of wife of deceased.
10. Name of husband of deceased.
11. Date of birth.
12. Date of death.
13. Cause of death, (*b*.)
14. Name of place, town or township, and county in which the person died.
15. Name and location of burial ground in which interred.
16. Any additional circumstances.

I hereby certify, that the above is a true return of the death and other facts above recorded.

Dated at ——— ——— } ——— ———
Wisconsin, this —— day of ——, A. D. 187— } (*c*) Attending Physician.
Residence, ——— County, Wisconsin.

NOTE.—(*a*) State the color so distinctly that the race may also be understood as white, black, mulatto, Indian, mixed white and Indian, etc. (*b*) Answer as definitely and specifically as possible, giving location of disease or injury, and if possible the cause thereof. (*c*) Strike out these words if the return be made by some other person, and add other explanatory words.

CHAPTER 110—REVISED STATUTES.

* * * * * * * * * * * * * * *

SECTION 4. Every physician or surgeon who shall hereafter be in attendance at the period of the death of any individual, dying within the State, shall make at once a record of such death, in a book kept by him for that purpose, and shall return the same, duly signed, in the form of a certificate, to the register of the county in which such individual may have resided at the time of the death, in the manner and within the period directed in the second section of this chapter; which record and certificate shall set forth, so far as the same can be ascertained, the full name, sex, and color of the person deceased, and his or her age, and also the name of his or her parents, the occupation, place of birth, the period, place, and disease, or cause of death, and if within his knowledge, the name of the burial ground in which interred, and if married at the time of death, the name of the husband or wife, as the case may be. All certificates or returns required by this chapter shall be signed by the parties so certifying.

* * * * * * * * * * * * * * *

SECTION 15. Any clergyman, justice of the peace, physician, or other person, who shall neglect to comply with the provisions of sections 2, 3, 4, and 12, of this chapter, shall forfeit for such neglect, a sum not less than fifty nor more than one hundred dollars.

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CIRCULAR NO. 4.

OFFICE STATE BOARD OF HEALTH,
APPLETON, WIS., December 16, 1876.

DEAR SIR: By direction of the State Board of Health a copy of the accompanying article on Small-Pox is sent to the editor of every newspaper in the State.

As it has been prepared in the interest of the public health the Board will be glad to have it given as wide publicity as possible.

In the furtherance of its labors the board will be glad at any time to receive copies of any publication in which information concerning the public health is given, or in which public health questions are discussed.

Very respectfully,

J. T. REEVE, M. D., *Secretary.*

SMALL-POX.

The appearance of Small-Pox in many places in our State, and the continued spread of the disease where it has found a foothold, calls for a word of warning and advice from those who have been constituted the guardians of the Public Health.

The average yearly death rate from Small-Pox in Wisconsin is somawhat over one hundred, while the average number of cases annually exceeds four hundred. Already *within the last three months* these numbers have been exceeded and unless vigorous measures are adopted and great vigilance observed, it will exact a much larger tribute of human life.

The experience of Wisconsin in this respect is not exceptional. This loathsome and very fatal disease is visiting other localities to such an extent that those who have watched its progress, greatly fear a wide-spread epidemic of it during the coming winter months. To be forewarned should be to be forearmed.

SMALL-POX IS PRE-EMINENTLY A PREVENTABLE DISEASE.

It is preventable because we possess the means by which we may reasonably expect to keep it from our homes, and from our community. It never visits either except as those means known to be able to prevent it have been neglected.

We urge upon the citizens of Wisconsin, upon the constituted authorities of every township, village, or city within its borders, and especially upon physicians, to institute such measures as will serve to stay the progress of the disease. The measures to be instituted are

VACCINATION AND RE-VACCINATION.

The undersigned have unqualified confidence in the protective power of thorough vaccination, believing that it can render to all persons *perfect* protection against any form of variolous disease—but to secure this protection, *three* conditions must be carefully observed.

1st. The virus used must be pure and vigorous.

2d. The operation must be skillfully and properly performed.

3d. Revaccination must be frequently practiced to test the returning susceptibility of the system to the small pox contagion.

By a strict and universal observance of these rules we believe that small-pox might be stamped out of existence. To neglect such rules is to endanger not only the life of him who neglects them, but also the lives of those with whom he associates. We believe there is no valid excuse for such neglect.

With regard to revaccination the facts are, that a certain number of persons are protected for life by one vaccination, while the protection of others extends to but a limited and variable period. Hence as we are without the power to distinguish between these classes, revaccination is as essential as a primary operation, and should be performed at least every five years. It should also be performed at every season of an epidemic diffusion of the disease.

Should small-pox unfortunately appear in any community we earnestly recommend the adoption of the following rules:

ISOLATION.

Thoroughly isolate every case **that may occur, and keep it so isolated until all danger that the disease can be communicated is past. If the patients be kept in a pri-**

vate house, it is better that the uppermost rooms of the house be used for the purpose—every person in the vicinity should be at once vaccinated without regard to any previous operation.

DISINFECTION.

At the close of the disease articles which can be so treated should be disinfected by being subjected to the action of boiliug water, or be baked in an oven at a temperature of not less than 212 degrees. Heat effectually destroys the poison germ. Such articles as cannot be so treated should remain in the room and be subjected to

SULPHUROUS FUMIGATION,

which is effected by placing about three pounds of sulphur in a safe and convenient vessel in the room with the doors, windows and chimney flues closed, and ignite it. The room should remain closed ten or twelve hours.

Ventilation, and painting the wood work, white-washing and re-papering the walls, will complete the process and fit the rooms for re-habitation.

E. L. GRIFFIN, M. D., Fond du Lac,
JOHN FAVILL, M. D., Madison,
SOLON MARKS, M. D., Milwaukee,
JAMES BINTLIFF, Janesville,
J. T. REEVE, M. D., Appleton,
H. P. STRONG, M. D., Beloit,
O. G. SELDEN, M. D., Tomah,
State Board of Health.

Circular No. 4 was issued in view of the alarming spread of small-pox. It was distributed to the press, as indicated, in December, and has been published in a large proportion of the newspapers of the State, thus receiving very wide circulation. As will be perceived, its subject matter is chiefly taken from the paper of Dr. Griffin.

There are now in the library of the board the following books which have been presented to it, to-wit: The Laws of Wisconsin for the year 1876, 2 vols.; the Report of the Secretary of State for the years 1875 and 1876, and the Legislative Manual for 1876, from the Hon. Peter Doyle, Secretary of State; a complete set, 5 vols., of the Reports of the State Board of Charities and Reform, from the Board; the Annual Reports of the Board of Health of the city of Milwaukee from 1870 to 1876 from James Johnson, M. D., health officer; the Annual Reports of the Massachusetts State Board of Health, vols. 1 to 7 inclusive, also the 33d Massachusetts Registration Report, from C. F. Folsom, M. D., Secretary of the Board; the 1st; 2d and 3d Annual Reports of the Michigan State Board of Health, also the Laws of Michigan relating to the Public Health, the Laws of Michigan relating to the Registration of Marriages, Births and Deaths and the 1st, to 5th Registration Reports of the same state from H. B. Baker, M. D., Secretary of the Board

the 1st, 2d, and 3d Biennial Reports of the California State Board of Health from F. W. Hatch, M. D., Secretary; the 1st Annual Report of the Georgia State Board of Health from V. H. Taliaferro, M. D., Secretary; the 4th Annual Report of the Minnesota State Board of Health from E. L. Griffin, M. D.; the 1st, 3d, and 4th Annual Reports of the Board of Health of the District of Columbia from D. S. Jones, Acting Secretary; the 1st, 2d, and 3d Annual Reports of the Virginia State Board of Health from L. S. Joynes, M. D., Secretary; the Annual Report of the Louisiana State Board of Health for the year 1875 from J. F. Fuller Esq: the Reports of the Metropolitan Board of Health for the years 1867 and 1868 and the Report of the New York Board of Health for the years 1871, '72, and '73 from Col. Emmons Clark, Secretary of the Board; the 1st, 2d, and 3d Annual Report of the Board of Health of the city of New Haven, from C. A. Lindsay, M. D., Health officer; the Annual Report of the Board of Health of the city of Pittsburg for the year 1875, from Crosby Gray, M. D., Health officer; the Report of the Board of Health of the city of Brooklyn, from 1873 to 1875, from Francis H. Stuart, M. D., Register of Vital Statistics; Executive documents Nos. 79 to 99, 2d session of 43d Congress, containing an account of the cholera epidemic of 1873 in the United States, from Col. F. H. Putney; the transactions of the N. H. Medical Society for 1875, and the transactions of the Wisconsin State Medical Society from 1868 to 1876 inclusive from the secretaries of these societies.

This office is also regularly receiving the weekly and monthly reports of the Boards of Health of various cities.

Acknowledgments are due to James Johnson. M. D., Health officer of the city of Milwaukee, to the secretaries of the State Board of Health of Massachusetts and of Georgia, and particularly to H. B. Baker, M. D., Secretary of the Michigan State Board of Health, for copies of circulars, blanks and other favors received from them.

There has also been added to the Library of the Board by purchase, one copy each of the following books of reference:

Parke's Manual, Cameron's Manual, and Wilson's Handbook of Hygiene; Leeds on Ventilation; Fothergill's Maintenance of Health; Eassie's Sanitary Arrangement of Dwellings; Letheby's Sewage Question; Filth Diseases and their Prevention; Richardson's City of Health; Walker's Statistical Atlas; The Sanitarian, Volumes 1,

2, 3 and 4, and subscription to volume 5; Wanklyn's Water Analysis; Chamber's Diet in Health and Disease; Michael's Manual, and Mapother's Lectures on Public Health; Halton's Lectures on Sanitary Subjects; Hilton's Health and its Conditions; Waring's Sanitary Drainage; and volumes 1 and 2 of the Papers of the Public Health Association.

There has also been purchased of permanent furniture for this office: 1 library table, 5 record books, 1 letter press, 1 letter book, 1 invoice book, 1 standard letter scales; and of consumable articles, letter paper, envelops, postage stamps and stamped envelops, and minor articles of stationery, such as ink, mucilage, elastic bands, lead pencils, &c., the specific items of which appear in the vouchers which have received your approval. A considerable portion of this stationery is yet unexpended.

The following is a summary of the expenses of the Board during the year, as shown by vouchers numbered from 1 to 37, inclusive:

Stationery and printing	$129 51
Postage and stamped envelops	161 01
Books of reference	87 60
Office furniture and record books	139 05
Personal expenses of members of the Board	297 15
Secretary	770 00
Miscellaneous (freight, express, etc.)	11 04
Total	$1,595 36

The above amount includes all bills which have been audited by the Board, and all expenses which have been incurred up to the 31st of December, 1876, except such as are connected with the cost of printing and distributing extra copies of the annual report, bills for which have not yet been received.

Very respectfully,

J. T. REEVE, M. D.,
Secretary.

Preliminary Report on Contagious Diseases.

Small Pox and its Prophylaxis.

BY E. L. GRIFFIN, M. D., OF FOND DU LAC,

PRESIDENT OF

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SMALL-POX AND ITS PROPHYLAXIS.

Among the *preventable* diseases Small-pox, by universal consent, stands pre-eminent, and therefore claims the most careful and patient consideration of every student of sanitary science. It belongs to that class of diseases which are called *preventable* because we know of means by which we may reasonably expect to prevent it, and in this way diminish the general mortality of the State. Infectious diseases, regarded by sanitarians as preventable, destroy many thousands of persons annually, besides carrying an untold amount of suffering and anxiety into the homes of the community.

It is not within the compass of this report to examine at length all the interesting and important features of this disease, but rather in plain and simple terms group together some facts of great interest which may be calculated to arrest the attention of the citizens of the State, with the hope that they may more fully appreciate and apply the simple preventive measures which are so cheap and so universally available.

We regret that we are not able to give statistics showing the absolute mortality from small-pox in the State for the last decade, or even for the last twelve months, but we are happy to believe that it has been small in comparison with that of many of the other States, nevertheless, during every year, there are more or less deaths from it. In an unexpected day and in a way not anticipated, it enters many homes and in its loathsome manner takes away the dearest treasures of the household, embittering the grief of the sorrowing with the painful consciousness that it might not have been.

"Our real happiness," says one, "must ever depend more upon community of health, than on pecuniary or any other circumstances, and it is to little purpose we labor to benefit ourselves, if the fruits of such labors are not shared by those on whom our affections rest. The loss of a child at any period of our lives is a dreadful calamity. Even when it comes upon us without warning under the dispensation of Providence, few can bear it with indifference; but when it is the direct instrumentality of a disease which might have been avoided, and the means of doing so was placed within our easy reach, compunctions and regret of the keenest kind cannot fail to overtake us."

The very general exemption which the State may have enjoyed during the past few years from the ravages of this disease has served immensely to increase the danger from its approach in the future.

Mankind are so generally indifferent and careless as to any duty or danger which does not immediately confront them, that the means of protection against this disease is most [illegible]

lected, and year by year the State is being filled by an element—unprotected—of all ages, which only awaits a tidal wave of small-pox, in which a large number of our citizens cannot fail to be swept away. It is quite likely that, excepting the larger cities lying along the thoroughfares of travel, and which are for this reason peculiarly exposed to an outbreak of small-pox, the inhabitants of a very large proportion of the towns in the State have, to a great extent, neglected the duty of vaccination. Our public schools, with few exceptions, are filled with unprotected children and youth.

In former times the great difficulties and slowness of communication protected mankind in a great degree from the ravages of contagious diseases; but in these later days the facilities for travel have so marvelously increased, as well as the herd of idle tramps that infest the State, that the danger to society, from frequent outbreaks and the spread of contagious diseases, has become very great.

The mortality from contagious and infectious diseases, at the present day, forms an extraordinarily large proportion of the total number of deaths, and this fact shows the great necessity of guarding against the extension of epidemic diseases by availing ourselves of all possible means of protection.

Under the United States registration, by the census of 1870, there were reported 4,507 deaths from small-pox in the United States for the twelve months ending June first, 1870. Of this number 2,012, or 44.64 per cent., were under five years of age. The number of deaths from this disease in Wisconsin during those twelve months were 104, of which number 52, or just 50 per cent., were under five years of age.

In the State of New York there were 582 deaths from this cause, and 318 of this number, or 54.81 per cent., were under five years of age. In Ohio there were 332 deaths, while 216, or 65 per cent., were under five years of age. It is fair to infer that these figures are an approximate index to the annual deaths from small-pox throughout all the States, and that the ratio of mortality of those under five years of age will annually be equal to that of 1870. It is quite likely, also, that with reference to the 2,012 deaths in all the States under five years of age, and of the 52 reported in Wisconsin, that but a small per cent. of them had ever been vaccinated at all, and that, with reference to those upon whom the operation had been performed, it was a total failure, either through an imperfect or unskillful operation, or by the use of inert and worthless virus.

These facts should direct attention to the statements already made, that there is a wide and general neglect of the duty of vaccination—that all our public schools contain more or less pupils who have not been thoroughly vaccinated, and that the number of unprotected and hence exposed persons in the State, now already fearfully large, is being annually increased.

Accepting the figures of 1870 as the proximate annual deaths from small-pox, and allowing the very liberal ratio of one death to every five cases of the disease, and we have the yearly number of

22,535 cases in the United States, or 520 cases in our own State—an aggregate amount of human suffering, distress and pecuniary loss, at which every thoughtful mind is appalled, when we consider at what a trifling cost of money or time each and every person can be absolutely protected against the approach of this disease.

No fact within the range of human observation is more thoroughly established than that vaccination, thoroughly and properly performed, secures the individual against an attack of small-pox. The exceptions are so few as to render the rule almost absolute. Over against this fact, let there be placed the other one, that there is no disease known in ancient or modern times, more contagious —more loathsome and more to be dreaded—than this, and the thoughtful mind becomes excited with amazement at the prevalent indifference, not to say criminal neglect, everywhere discovered.

If it be true, as has been said, that "man in the exercise of a wise forethought and of his best intelligence can protect his health and control the ravages and mortality from specific and preventable diseases which overtake the ignorant and the careless," it is clearly the duty of the intelligent people of the State and the custodians of public welfare, to see that all available means are used looking to so beneficent an end.

HISTORY.

The history of small-pox is clothed in much obscurity. The question of its origin, antiquity and spread has been a matter of careful and laborious research, but has not elicited an answer definite and satisfactory. Its highly infectious and contagious nature was early recognized, while at the same time it was believed to arise spontaneously under certain circumstances of climate and soil, such as heat, moisture, filth and decaying organic matter. This false theory of its multiple origin has long since been exploded, and the fact established that small-pox spreads exclusively by contagion. It is always disseminated by means of a specific virus which is begotten in the bodies of small-pox patients, which specific virus being applied to a second party through the skin or through the lungs, reproduces itself. It is never spontaneously developed under any circumstances whatever.

This disease does not appear to have been indigenous in Europe, but to have been introduced there at a relatively late period from other lands, "no one of which," says Curschman, "can with certainty be alleged to have been its cradle."

Ambiguous accounts of it have come down to us from China and Hindoostan, where it is thought to have existed long before the Christian era. The first accurate and satisfactory description of it seems to have been given by an Arabian physician, who lived in the early part of the tenth century. It was known throughout England in the latter part of the ninth century, and, after the Crusades, it prevailed in most parts of Europe. All dreaded its presence, and there seemed to be no power to stay its ravages. After the discovery of the Western Continent, it passed

hither with the tide of emigration, and, in 1517, was carried into St. Domingo, and from thence, in 1520, into Mexico, from whence it spread throughout the Western Continent. On its introduction into the city of Mexico, according to Robertson, it destroyed, in a brief space of time three and one half millions of people. Being introduced into Iceland (1707), it swept away one quarter of the entire population. It reached Greenland in 1733, and very nearly depopulated the country. During the eighteenth century, one tenth of the population of the globe died with this disease, while many more were disfigured by it. In Europe, 400,000 persons died annually from this disease alone. From historical accounts the first visits of small-pox into any country or section of the globe, has always been followed by the most fearful devastation. It has very strikingly illustrated the law that seems universally true, that "a contagious disease is always most virulent on its first introduction into a new scene of actiou." As far back as we have any knowledge of the disease, it has been the scourge of all countries where it has existed. Up to the commencement of the present century, it was by far the most formidable and fatal disease that afflicted mankind.

The eloquent English historian Macaulay, in speaking of the ravages of the plague during the seventeenth century, assigned to small-pox the foremost place as "the most terrible of all the ministries of death."

Very few at that time escaped an attack of the disease, and most of those who survived an attack were left with impaired health or serious disfigurement. The average annual deaths in England from this cause were about three thousand to every million of inhabitants, a death rate, says Seaton, which with the present population would give a loss to the kingdom of more than sixty thousand of its citizens. The bills of mortality in London show that during the last half of the eighteenth century, the population was decimated every year by this terrible scourge.

It is well to refresh our minds by these facts in the history of this disease that we may the more fully appreciate the great blessing of vaccination to mankind, for since its discovery, small-pox, in civilized countries, has ceased to be so general or to manifest itself in such wide-spread destruction. And yet, if it were possible at once to remove the protection which mankind now enjoy by this practice, no one can doubt but that the horrors of the last century would return upon us.

It is without doubt true that neither lapse of time nor any improved mode of treatment have served to materially change its malignancy or fatality. Dr. Jurin, as quoted by Seaton, writing early in the last century, laid it down as the result of his investigations, that of persons of all ages taken ill of natural small-pox, there will die one in five or six. Statistics of hospital reports gathered up during the first quarter of the last century show that from twenty-five to thirty-three per cent. of all cases die. We have only to study the disease as it has appeared from time to time in the large cities of our own country in an epidemic form, to be convinced

of the fact that the fatality of the disease has undergone up to the present time little or no essential change.

During the epidemic which prevailed in the city of Mobile in the winter of 1874–75, the percentage of deaths to cases was 26.46, while in 1873, in the same city, when yellow fever was epidemic, the death rate for that disease was only 15 per cent., showing a fatality of the former disease of nearly double that of the latter.

In 1865, during an epidemic of small-pox in London, in the small-pox hospital 47 per cent. of the unvaccinated died. In the same year, in Berlin, the percentage of deaths was 42, including hospital and private practice. During the years 1873-74 and 1875, in the city of New Orleans, there were 3,149 cases of small-pox with 1,307 deaths, a per cent. of 41.29. In 1868-9 it was epidemic in San Francisco, Cincinnati, and many other cities, but in these two places especially it claimed a large tribute of human life. At these points its manifestations were as malignant and the mortality among those attacked as great as at any period before the discovery of vaccination. It is reported to have been if possible more severe in private than in hospital practice. Dr. F. W. Hatch, the present secretary of the California State Board of Health, reported, in both private and hospital practice an average death-rate of one in three cases. Dr. Logan, in his report of cases in San Francisco and Sacramento, gives even a larger per cent. of mortality, and he justly remarks, "this fatality is almost unprecedented in the annals of this disease."

During this same season many of the Indian tribes were visited by this disease, and the ravages were said to be fearful. Whole encampments were attacked and large numbers swept off.* In Cincinnati the deaths were one in every five and a fraction. During the winter of 1876, this same city has been visited with as extensive an epidemic and nearly if not quite as fatal a ratio. At the present writing, August, 1876, San Francisco is again paying the fearful penalty, in human lives, for great neglect of preventable measures, while passing through another epidemic as malignant and fatal as that of 1868-9.

These facts are grouped together to impress the mind with the fact that this loathsome disease has lost nothing of its virulence and fatality, but that, given as favorable soil in which to work, it goes abroad among the cities of the land now, as a century or more ago, "the most terrible of all the ministries of death." They forcibly impress the mind with the criminal neglect of the people, that while it is so preventable a disease, and the means of prevention are so ample and reliable, it is permitted to stalk abroad, destroying one in every three or five it attacks, "blasting the beauty of the rest," and bringing distress and desolation into thousands of homes and human hearts.

The mortuary tables of nearly all our large cities duplicate the above facts, showing that everywhere among the unvaccinated and unprotected, this disease is as fearful in its harvest of death as in olden times.

* See W. B. Davis' report on vaccination.

Since then there is prevalent so large an amount of small-pox, so severe and so fatal, it becomes imperative that we should extend our inquiries in order to ascertain what defects exist in the machinery of prevention, which are capable of improvement. It has been said that deaths from small-pox should be among the rarest entries in the register.

There can be but one answer to our inquiries—namely—*neglect of thorough and complete vaccination.*

After more than three-quarters of a century of accumulating evidence of the almost absolute protection which may be secured by vaccination, argument in support of this fact seems hardly necessary.

Dr. Logan, physician to the small-pox hospital in Sacramento, in his account of the epidemics of 1868–9, says: "The primary and chief cause is inattention to vaccination. That the extreme prevalence of the disease is not due to failure of the antivariolous power claimed for vaccination, but to the neglect or absence of its protecting influence." Dr. Gibbons, in writing upon the same epidemic, says: "Let me state a fact of immense magnitude in its bearing on this question. During the prevalence of small-pox in San Francisco, covering the greater part of the year, not a physician contracted the disease, nor a professional nurse, nor a solitary member of the families of physicians or nurses. * * * Those persons who armed themselves properly with the shield of the immortal Jenner, walked unscathed amid the rankling pestilence while ministering to its victims." During the same year the Health Officer of Cincinnati writes that full ninety per cent. of those who died of small-pox in that city were unvaccinated, and that no death occurred in which there was unmistakable evidence that the individual had been previously properly vaccinated. He further says: "We are driven to the conclusion that the lives of 580 persons who died during the year 1869, in Cincinnati, might have been saved by vaccination alone. This is certainly a very remarkable instance," he observes, "of criminal neglect of duty, or of ignorant bigoted prejudice."

It is a question of vital importance in our inquiry, What are the conditions precedent upon which an individual or a community may receive perfect protection against small-pox by vaccination? It may be premised as a settled fact that a true and perfect vaccination is a sure preventive of this disease, and that an outbreak of it can occur only as the result of neglected or imperfect vaccination. This proposition is accepted by every medical man of education and experience, as well as by every intelligent citizen.

We submit the three following points:

1.—THE OPERATION SHOULD BE SKILLFULLY AND SUCCESSFULLY PERFORMED.

It does not follow because a person has been vaccinated that he has been properly vaccinated, and is in consequence protected. Undoubtedly there are unfavorable conditions under which it is

often necessary to perform the operation, and which are difficult to eliminate from it. But the mere manipulation of the vaccinating instrument is a matter of more importance than is generally attached to it. "It is not merely a trick of the fingers."

It is to be feared that ordinary vacinnations as practiced by the average physician throughout the country are too often defective. If the operation is followed by a sore, while the characteristics which denote a protective result are nearly all absent, the case passes from observation, the dupe of a false security and a dangerous delusion. The unkindest fraud which can be practiced is to impose a false security in this regard. Where health and life are at stake, and such grave issues may result, ignorance and stupidity should give place to conscientious care and skillful manipulations. "If," says Marson, "a little operation—little important in practice, but very important in its results—well performed can save many lives, as most certainly it can, and prevent much suffering and sorrow, it should surely always be done with the greatest care and in the best known way. The success of all operations depends upon nice care and management.

After a most thorough and painstaking observation upon many thousand cases in children, so thoroughly convinced were Drs. Seaton and Buchanan, experts in this department of study, of the faulty and imperfect operations so generally practiced, that they felt compelled to strongly recommend that this operation should be committed to a few thoroughly trained vaccinators, who should devote themselves exclusively to this work. Hence, in many places in Europe the matter is held to be of so much importance that instructions are issued yearly from a central vaccine board to all vaccinators throughout the country, instructing them upon the points essential to success in this process. [Toner.]

The mere introduction of the virus into the arm is an operation so simple that it has led to a promiscuous domestic practice wherein many cases are assumed to have "taken," when the conditions essential to a complete protection have never been present.

No other duty is fraught with more responsibility than that of affording immunity from small-pox. This service has a special claim upon the candid and careful attention of every physician who stands as the true remedial guardian of the people among whom he resides.

However trifling it may seem as a surgical operation, there is nothing more certain than this, that careful observation, practical experience and painstaking accuracy are indispensable for securing its most perfect results.

All great masters of this practice, from Jenner to the present time, have taught that the merits of vaccination will always appear in proportion to the merits of the operator. "If sickly children are vaccinated without regard to their actual condition—children breeding other disorders or having skin diseases,—the result will be very likely to be unsatisfactory."

Not only is it necessary that the operation itself should be perfect, but it is equally essential that the subsequent evolutions of

the case should be normal and typical. Hence every case should be held under observation by the operator to that extent which will allow him to recognize all the processes of maturity and note any deviation from a typical standard. The physician who renders this service acts under an implied and recognized duty to confer upon the patient, by the operation, the most complete and perfect protection against small-pox, which vaccination is capable of doing. To do less than this is a violaation of an assumed obligation and a stigma upon his noble and beneficent calling. It is obvious that this demand cannot be conscientiously met without much careful study and patient observation. There should be no uncertain guess-work, but knowledge based upon the study of the best approved methods and careful personal observation. This being so, the folly of confiding this operation to nurses, midwives, barbers or any other party excepting the intelligent physician, becomes apparent. He alone is capable of appreciating any significant or important deviation in the progressive evolutions of the pock, which should cast suspicion or distrust upon the operation. Any such deviation demands a renewal of the operation, under conditions which shall be, if possible, more favorable to success. The failure to do this gives false security which raises questions of doubt in the minds of many as to the prophylactic value of vaccination. A failure to appreciate a perfect operation costs a large annual tribute of human life. Until the consequences that may result, indeed are almost sure at some time or other to result, from the bad and unskillful performance of this operation have taken thorough possession of the public mind, these faulty operations will continue to be found.

2—THE VIRUS USED MUST BE VIGOROUS AND OF UNDOUBTED PURITY OF STOCK.

This is a matter of the utmost importance. This condition of success needs no argument. When enfeebled or deteriorated lymph is used, a limited modification of the susceptibility of the system to the vaccinal and variolous disease is produced. Under this condition a subsequent vaccination, even with the most active and vigorous lymph, results in only a modified expression of the vaccinal disease. As a rule, it is not possible to secure a typical vaccinal expression when once the system has been brought under the partial influence of vaccinia by enfeebled or deteriorated lymph; hence the great necessity that in all cases vigorous and active lymph should be used so that the system shall be thoroughly saturated and hence thoroughly protected by its influence.

The lymph should be taken only from perfectly healthy subjects and from thoroughly characteristic pocks,

Previous to the introduction into this country, in the autumn of 1870, of animal vaccine, and its propagation for general or commercial use, the supply of good reliable lymph of the humanized form was very limited and inadequate to meet a sudden demand. Upon the appearance of small pox in a community, it was often

difficult to secure from any known source that of undoubted purity and vigor. The urgent necessities of such outbreaks have been met by such material as was available, and hence a large amount of vaccination has been performed which was undeniably spurious and unprotective. Furunculous sores have been produced in infinite numbers, which by the ignorant and uninstructed have been accepted as the genuine protective vesicle of vaccinia. The very miscellaneous way in which physicians have so often been compelled to procure lymph has served to greatly increase the number of those who are resting in a false security. A great error also prevails in the community even among those who entertain no doubt as to the necessity and propriety of this operation, in that so many neglect this simple duty until prompted to it by an outbreak of small pox, and the presence of real danger. At such times there is great danger that the operation may be hastily and imperfectly performed, and with carelessly selected lymph, for there is generally a pressure upon the operator for virus which he is not able at once to meet, and the temptation is great, and probably not always resisted; to use material which in times of less excitement and pressure would be rejected. This operation should never be left to a season of panic.

It is the opinion of careful observers of the vaccinal disease that the character of the vescile is an index to the protection produced. As a general rule it may be said also that the results obtained by the use of virus are a good indication of the strength and perfection of the stock from which it come.

Liquid lymph taken upon a surface—an ivory point or quill slip —at the period of its greatest activity, a period just anterior to the full pronouncement of the areola, is without doubt the very best form in which vaccine virus can be used. In this form it possesses all the possible vigor inherent in the stock and at the same time has little or no animal matter mixed with it. In this form there is little danger ot transmitting in the subject diseased, germs, which it is possible may exist in the decomposing animal matter always found in the crust.

It is confidently believed that a large amount of spurious, enfeebled and not wholly protective virus has been used through these many years past in this country.* That such has also been the case in England appears evident from the recent report of Registrar General, wherein he shows that the deaths among those who had been vaccinated were 13.5 in each hundred cases, a rate only to be accounted for by reason mainly of the too general use of humanized virus which has failed to give the maximum of protection.

It is not within the purpose of this report to discuss, at length, the relative merits of animal virus as compared with humanized. We give it as our opinion that properly selected humanized virus of the first remove from the heifer, by human transmission, will afford as perfect a protection as is possible to besecured. But the humanized virus is so very generally procured and used under such

*See report on vaccination by the writer in Transactions of Wisconsin State Medical Society, 1874.

varied vicissitudes and with such an imperfectly understood history, that a conscientious operator must often entertain doubt as to its vigor and the certainty that it will give the maximum of protection. It is a question whether there is any vaccine in use in this country whose pedigree is known and which is worthy of confidence, excepting that which is produced from the calf or can be traced to that source through a few near removes by human transmissions.

Every operator is held by public sentiment and considerations of professional honor to the exercise of the greatest vigilance and care in the selection of humanized virus. Experience has demonstrated that the vaccinal disease, when imparted to certain subjects, produces in them an imperfect or modified development, and that lymph taken from such subjects has so far lost its character, when perpetuated through other subjects, as to give rise to an imperfect vaccinal disease. There is then under certain circumstances, a degeneration of virus taking place; once we can readily understand that when virus is carelessly selected, this may seriously damage the degree of protection. Hence in the choice of virus, special reference should be had to its quality. This will lead to a knowledge of its origin. If it is animal virus, it should have an accredited pedigree—and must be propagated under the direction and by the hands of a thoroughly competent person. If of human origin we should know its remove from the heifer, and that it has been propagated through healthy and vigorous persons, and those vaccinated for the first time. I think nearly all operators who have carefully studied this subject advise the use of heifer lymph when it can be obtained. When this is not accessible, that which is only a few removes from it. The nearer the better.

The use of heifer lymph not only ensures the maximum of productive influence, but removes all possible objection on the part of any who are unwilling to subject themselves or their families to the operation through fear of the introduction into the system of some associated disease. While it is found that the possibility of transmitting diseases by vaccination is far less than is generally supposed, and that this possibility can be asserted positively only of syphilis, nevertheless in a procedure which so many contend against, and which, especially in the minds of the laity, is so objectionable, even the appearance of error must be most scrupulously avoided, not only for the personal interests of the physician, the interest, especially of good cause," [Curschman.]

Dr. Geo. E. Walton, of Cincinnati, in a recent paper upon the

"COMPARATIVE MERITS OF ANIMAL AND HUMANIZED VIRUS."

Summarizes the subject as follows:

1. "It is certain that humanized virus produces immunity from small-pox for a number of years."	1. "It is certain that bovine virus produces immunity from small-pox for a number of years."
2. "It is certain that humanized virus may convey syphilis."	2. "It is certain that bovine virus cannot convey syphilis."
3. "It is possible that humanized virus may convey other diseases."	3. "It is not probable that bovine virus conveys any disease."
4. "It is probable that humanized virus degenerates."	4. "It is not probable that bovine virus degenerates."
5. "It is certain that many persons oppose humanized vaccination."	5. "It is certain that few persons will oppose bovine vaccination."
6. "It would not be right to compel vaccination with humanized virus."	6. "It would be right to compel vaccination with bovine virus."

WE ADD,

7. It is not possible to procure humanized virus in sufficient quantity to meet a great emergency.	7. It is possible to procure, on short notice, bovine virus in quantity to meet any emergency.

3.—THE OPERATION SHOULD BE REPEATED AS OFTEN AS NECESSARY TO TEST THE RETURNING SUSCEPTIBILITY OF THE SYSTEM TO THE SMALL-POX CONTAGION.

It is quite evident that the public mind is uninformed and unsettled in its convictions upon the protective range of a primary vaccination and the necessity of a re-vaccination. Jenner taught that protection from vaccination was life-long. The expectations begotton by him and the early teachers that a successful primary vaccination in infancy or early childhood would give security against an attack of small-pox for the remainder of life, are cherished, through ignorance of facts, by a great many at the present time, and this supposed security becomes their greatest source of danger. "Best safety lies in fear."

Less than twenty years had passed after the discovery and promulgation of the practice of vaccination, when it began to be observed that some of the vaccinated took on a mild form of small-pox. The experience of three-quarters of a century has proved, beyond all question, that the protection afforded by this practice is not life-long. Though most effective in mollifying the disease, it is not to so great an extent a preventive as was once believed.

The question as to *how long* will the protective influence of a perfect vaccination in infancy or early childhood last, cannot with certainty be answered. All careful observers are agreed that this protection is for a few years, certainly, reliable and complete. It

is certain that one person may be protected for a longer time than another. The range of susceptibility to any contagion is very wide in the human family. One individual will contract disease while another equally exposed will escape. The evidence is very abundant, that, apart from all faults in the operation or of any enfeeblement in the virus used, there occurs, from natural causes, a tendency towards a return of the susceptibility to small-pox contagion, commencing probably not very long after primary infantile vaccination, increasing with the growth of the child, gaining intensity at about the puberic period, which does not diminish again except under advancing age. After infancy is passed the period of life in which most persons are liable to contract small-pox is from fifteen to twenty-five years of age. It is the same with the vaccinated and the unvaccinated, although the degree of liability is not the same. [Ballard.] Hence it is that revaccination is recommended, not because it is absolutely necessary for all, but because it is impossible to predicate who among the multitude vaccinated in infancy has re-acquired a receptivity to the contagion.

Comparatively few, in this country, at least, entertain doubts as to the necessity or propriety of a primary vaccination, but with regard to *revaccination* it is feared that the great bulk of the people have no intelligent and well settled convictions as to the time when a revaccination should be performed or the absolute necessity for such an operation. I wish it were possible to bring home to the minds and belief of the general public an intelligent and abiding conviction regarding revaccination—that it is a means by which we may secure almost absolute protection against any form of small-pox, and reduce the death rate from that disease to an absolute zero. In those countries in Europe where vaccination has been thoroughly performed, followed by universal revaccination, small-pox is all but annihilated, and deaths from it unknown.

"It is unfortunate," says Bousquet, "that art or nature has no sign to distinguish between those who need vaccinating and those who do not." Hence the practice should be universal.

"A small portion of vaccinated persons are protected through life by one operation; an indefinite number only for a certain period of time. The length of time they are thus protected is undetermined. Hence we are forced to admit that as a means of protection, revaccination is as important as a primary operation."

Since there is no known law governing the duration of the protective influence of a single vaccination, and since this period of protection varies widely in different individuals, it is safe, with our present knowledge, to advise that revaccination should be practiced every five years. It is better that the period should be needlessly short than too long. If small pox is prevalent in a community, the circumstances of the case should dictate the operation rather than the period of time only.

In reviewing the great mass of testimony upon this subject there is but one conclusion at which we must arrive, when considering the utility and desirableness of revaccination. While it is not wise to subject the individual or the public to any useless incon-

venience, it is better to err, however, in making the periods between too short than too long.

By a careful and universal observance of these conditions, we believe that this disease can be absolutely banished from the State. Until these conditions are conscientiously and carefully observed by the people, and by all having especially in charge the health of the citizens, small pox will continue to appear in many localities every year, causing great apprehension, distress and sorrow among the people, while in the larger cities, it will often appear as an epidemic and take from the productive force of the State a large tribute in human life.

In reply to special circulars issued to some two hundred physicians practicing in different localities in the State, asking for an estimate of the proportion of the citizens of the State who are thoroughly protected by vaccination, the average ratio, taken from all those heard from, sums up *less than one-half*. My own opinion, formed from an extended observation, is that *less than one-third* of the population of the State are thus protected, leaving two-thirds, or 725,000 persons, in the State liable, upon exposure, to some form of variolous disease. The fact is cause for great amazement that so large a number neglect so cheap, so safe, and so beneficent a measure, and forces the mind of the political economist and the student of sanitary science to seriously consider the duty of the State to adopt measures which shall be so far compulsory in their nature as to secure a more general observance of the practice of thorough vaccination.

This question of enforced vaccination has occupied the attention of nearly every civilized nation, and wherever such regulations have been instituted the results of the procedure have shown the wisdom of such measures. A considerable class in every community remain unvaccinated through ignorance, through indifference, through neglect, though prejudice and through willfulness, and thereby become the medium by which small-pox may be indefinitely kept alive in every community. This class of persons cannot be reached but by authority, and the question of compulsory procedures has for years past demanded the attention of our legislators.

If it is "the duty of our rulers and those responsible for public measures to protect every member of society from preventable disease, then surely in a measure of such utility and general beneficence as vaccination is conceded to be," the State would seem to be justified in exercising its authority for the general observance of this practice.*

"We are aware that upon this subject there is much diversity of opinion. It is claimed that 'forced activity, even in the most noble field or self hygiene, is repugnant to the genius of the American people.' That they 'will not be driven blindly to the performance of any act dictated to them by some authority assuming a power not emanating from or conferred by, their sovereign will, for they are justly jealous of their rights to rule and reign over them-

* See paper on compulsory vaccination by the writer, in transactions of Wisconsin State Medical Society, June, 1875.

selves.' But it must be remembered that we already have many laws enacted which restrain the freedom of individual action in a variety of ways and compel the performance of certain acts that many would be otherwise unwilling to perform, and only submit to for the purpose of escaping fines and imprisonments. In all civilized governments there is a principle running through and underlying *all* law which secures the greatest good to the greatest number. And this principle should meet with the least resistance when it finds its beneficent expression in those hygienic measures which aim to secure the health of the individual while equally protecting that of the whole community. In this particular instance *all* would be benefited and *none* injured.

"Our English friends are as strongly disposed to resist interference with their personal liberty as we are, yet by judicious legislation, beginning with the vaccination act of 1840, and followed by the vaccination extension act of 1853, the public opinion of that country was educated by degrees to the necessity and justice of a law that should be comprehensive enough to reach every individual Such an act was passed in 1867.

"If we examine the record during these periods as compared with similar period before these enactments, and see what have been the results, we find that in the city of London one hundred yeare ago, with but a fourth part of its present population, the average annual mortality from small-pox was 2,200, being about one-tenth of the deaths from all causes. From 1800 to 1810 the average was 1,250, or about one-sixteenth of all the deaths occurring. From 1830 to 1840,the yearly average was 573, or one-forty-third of all the deaths. From 1850 to 1860, the average yearly deaths from small-pox was reduced to one-ninetieth of all deaths from all causes; and although the population is rapidly increasing the death rate from small-pox has continued to decrease.

"In Scotland, vaccination was made compulsory in 1864. For the ten years previous the yearly average of deaths from small-pox was 1,054. In 1865 it fell to 175. In 1867 to 124. In 1868 to 25.

"In Ireland, vaccination was made compulsory in the same year. The average mortality from small-pox had been from 1830 to 1840, 5,800 annually. From 1840 to 1850, 3,827. From 1850 to 1860, 1,272. In 1867 it was reduced to 20. In 1868 to 19. In the first quarter of 1869 there were but 3 deaths from it. In the second quarter none. This very nearly demonstrates that by the universal application of the vaccine prophylactic the disease would very nearly be banished from human society or become of very rare occurrence under the efficient operation of legislative enactment.

"The pecuniary value of the lives annually lost by this disease, it may not be possible to estimate, but we may form some conception of the cost to families and towns, of the attendance and care incident to such loss of life. If we assume that for each death occurring there are five cases of sickness, and each case of sickness requires the services of at least one attendant for three weeks, and add to this the destruction of clothing generally incident, together with the interruption of the occupation of other members of the

family, we shall find that each case involves a probable loss or money outlay of $150—at least upon a low estimate, $100."

By report of Dr. James Johnson, health officer of the city of Milwaukee, it appears that from July 1871, to April 1873, there were in that city 1388 cases of small pox, of which number 480 proved fatal. During the year 1874, only 33 deaths from this cause are reported. For the year 1875, not any. At the present writing—December 2, 1876, there have been reported by the health officer of that city 120 deaths from August 1, to December 1, 1876. As a very large proportion of the deaths from this cause in the State occur in that city, it will be seen that for all practical purposes it would be safe to assume that the average annual deaths by small pox in the State, will not fall below the United States Census Report of 1870—namely 104.

That we have not overestimated the average cash outlay of each case of small pox which occurs in any locality, we refer to the report of the health officer of the city of Toledo, Ohio, for June 1876, by which report it appears that in the care and treatment of seventeen cases, that city was required to expend the sum of nearly $1,600.

During the winter of 1873–4 the city of Fond du Lac expended something over $1,500, in the care, in part or wholly, of eleven cases of this disease. Upon the estimated basis of cash cost of each case above stated we are brought to the round sum of $15,600, the annual cash cost of the presence of this disease in the State; and if we add to this sum the value of these lives to the State as a productive force, upon the estimated basis of political economists, namely, $3,000 each, we reach the additional sum of $312,000 annual loss to the State. These figures teach us that the true econony of the State looks to the saving of life—the saving of health and time and working power as of paramount importance to the saving of money.

It hardly admits of a doubt that if what is actually expended, together with that which is lost, directly and indirectly, in the loss of time, destruction of property and derangement of business, in one year, could be appropriated to the thorough vaccination and revaccination of all the unprotected citizens of the State, it would be amply sufficient to put all in a condition of absolute protection.

It is not alone the death rates which show the losses sustained by small-pox. According to the estimates of the Board of Health of the city of Philadelphia there were 25,000 cases of small-pox in that city during the winter of 1871–72. In a very able paper read before the Public Health Association upon

"THE COST OF A GREAT EPIDEMIC,"

Dr. Benjamin Lee furnishes an approximate determination of the loss sustained by that city in dollars and cents by this great epidemic, and contrasts with this the degree in which this loss might have been prevented by judicious legislation, rigidly and fearlessly enforced.

The total loss sustained during the epidemic of those years is placed at the enormous sum of nearly twenty-three millions of

dollars; and it was the conclusion to which Dr. Lee arrived that fully ninety per cent of the cases and ninety-seven and one-half per cent. of the deaths could have been avoided, which would have reduced the actual necessary cost for sickness, deaths, and disability to about three-quarters of a million. Averaging the value of a human life he finds that the actual loss sustained by reason of sickness, deaths, and disability was nearly sixteen and a half million of dollars.* These figures are not the product of the imagination but the outcome of a careful study of all the facts entering into the history of this disease when it fastens itself upon a city in a malignant and epidemic form, and they are strikingly suggestive of the great necessity that exists in every community for a more perfect observance of preventive measures. It is in keeping a population thoroughly vaccinated and revaccinated that the real economy of life and health and money lies.

OTHER PREVENTIVE MEASURES AGAINST SMALL-POX.

When a case of small-pox is discovered in any community, the first care should be to *isolate* it. This is a measure not always easy to be accomplished. The case should be at once reported to the local Board of Health, or Health Officer of the town, who should co-operate with the attending physician in all measures necessary to confine the disease to the locality where it may first have appeared.

If the case occurs in a compact community or city, and among the poorer classes who live in crowded rooms and houses, it may be necessary to remove it to a hospital or building used temporarily for that purpose. But when a well-ventilated and convenient room can be given up to it, there may be no necessity for such a removal, although the case may be situated in a locality densely populated.

Better that those who are *well* be removed and suffer the inconveniences and discomfort of a separation from home for a season than that the unfortunate member, already overtaken by a great and sudden calamity, should have super-added needless exposure, inadequate conveniences, meager comforts, with indifferent and often incompetent attendants. The burden should always be made to rest as lightly as possible upon the sick, while those who are well should cheerfully bear the inconvenience imposed by the calamity.

The sick person, if in his own house, should occupy a room as elevated as possible, or as is consistent with good ventilation, and he must be secluded during the whole progress of the disease, and so long as it may be possible for him to convey the disease to others.

All carpets, unnecessary bed clothing, wearing apparel and furniture not essential for the comfort of the sick, or convenience of the attendants, should be at once removed from the room, and after the patient has recovered, no article or bedding, clothing or furniture should be removed from the room until the same has been thoroughly disinfected. Those who are the nurses and attendants must have been thoroughly protected against the disease by thorough

* See monograph on vaccination, by W. C. Chapman. M. D., p. 2.

vaccination or a previous attack of the disease, so that they shall be incapable of contracting it, and in that degree non-conductors to others.

All persons, young and old, who have been exposed, or may in any way have come into possible contact with the sick one, should be at once thoroughly and carefully vaccinated, and this without reference to any previous operation. To guard against any possible error in the operation, or any want of vigor in the virus used, it is well to repeat the operation upon the second or third day, and if possible with a new package of virus. This operation should be extended to all persons within the radius of a block, and should include every person, without reference to any previous vaccination or revaccination. Should any party, known to have been exposed, have left the locality, his whereabouts should be ascertained and his unconscious danger made known to him, with a view to measures for his greater safety.

The bodies of those who have died from small pox are capable of conveying the disease; hence all funeral services should be omitted.

Should, however, no such environments to the case be made as we have indicated, or should these barriers be passed and new cases be developed, the same general course should be pursued, coupled with the utmost care and vigilance. In the larger cities, it is seldom that an epidemic of this disease comes upon the people without timely warning. The disease spreads slowly, and it is generally many weeks before there is anything like an "epidemic diffusion." This is the *opportune moment—the hour for action*, and it depends entirely on whether advantage is taken of this interval or not, whether there shall follow the distress and loss which marks the pathway of an epidemic of this disease. At such times the local health officers—the town or municipal authorities, and the medical profession should heartily co-operate and vigorously and fearlessly institute such measures as we have indicated, or as may seem to them best. The public attention should early and earnestly be called to the necessity of thorough vaccination and revaccination. All legal authority should be exercised by the local health officer to secure as complete an observance of this practice as possible. At such times every citizen is especially called upon, not only to protect his person and family from this pestilence, but also the community in which he lives. Whatever the circumstances under which we are compelled to encounter this disease, and whatever its stage of diffusion, we have in vaccination and revaccination, the means of controlling and subduing it, and with these means together with disinfection, the power to eradicate it.

DISINFECTION.

This is one of the three efficient measures to be adopted in checking the spread of this disease. To be of value it must be thorough. The accepted methods are simple and not attended

with great expense and may be made very effective. Three agents only are absolutely necessary; namely—*boiling water*, *sulphur fumigation*, and *ventilation*.

Many other agents can be used, but these are cheap, always available, and when used with thoroughness, reliable.

As before advised, all articles used about the patient, such as sheets, pillow-cases, blankets, and clothes must remain in the sick-room until thoroughly disinfected.

The New York Board of Health advise that they be soaked for *one hour* in the following solution before being placed in boiling water for washing.

Sulphate of zinc, eight ounces.

Carbolic acid, one ounce.

Water, three gallons.

They also recommend that a piece of muslin a foot or more square, kept wet with this solution, be suspended in the sick-room and in the hall or passageway leading to it.

The infecting element of small-pox is absolutely destroyed by boiling water or an equivalent degree of heat otherwise used. All articles which can be conveniently treated by boiling water should be thoroughly boiled while such as cannot be so treated must be subjected for a time to a temperature of at least 212°. Dry heat when it can be applied is the most efficient of all disinfectants. Feather beds and pillows, mattrasses and heavy woolen articles must be subjected to sulphurous fumigation and should be left in the room until that is done. Straw beds should be burned.

The floors and the walls of the room, together with such articles of furniture as can be subjected to such a process without damage, should be thoroughly scalded with boiling water.

To fumigate a room with sulphurous acid, close all the openings into the room, such as doors, windows and chimney flues, and ignite from two to three pounds of sulphur, placed in a convenient and safe vessel. This amount will be sufficient for an ordinary sized room. The room should be kept closed for ten or twelve hours.

After this it should be well ventilated by the introduction of fresh air from all available openings, the current being quickened by a brisk fire in the stove or fire-place for a time.

To complete the process the ceiling should be whitewashed, and also the walls, or repapered.*

These plain and simple rules of procedure have been found effectual under the severest test. They can be understood and practiced by all, and are commended for a trial by those who may be so unfortunate as to require the use of such measures.

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* See history of Small-pox epidemic in Mobile, Alabama, by Jerome Cochran, M. D., 1875.

SEWERAGE AND DRAINAGE.

BY SOLON MARKS, M. D., OF MILWAUKEE,

MEMBER OF

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SEWERAGE AND DRAINAGE.

It is not the purpose of this paper to attempt the advancement of anything new upon the subject of sewerage and drainage, as many volumes have been written by persons entirely competent to fully set forth the importance of sewers and drains, and all the details of their construction. It is simply the intention to gather such facts, from different authors, as shall be of practical benefit to those who are interested in preventive or State medicine.

Notwithstanding all that has been said and written, few persons have given thought to the subject, and fewer still have any adequate idea of the importance of these silent, hidden, subterranean guardians of the public health.

HOW SEWER PIPES SHOULD BE LAID—DECLINATIONS, ETC.

With regard to the sewers in the cities in our own State, it may be said that there is less fault to find with the materials than with the manner of laying. We have the hydraulic cement pipe, the vitrified clay pipe, and the common brick sewer.

Whatever difference of opinion may exist regarding the size and shape of sewers and the manner of their construction, all agree that the materials should be such as to prevent the escape, not only of the liquid portion of the sewage, but more especially of that subtle. deadly poison—sewer gas.

Formerly sewers were built much larger than was necessary to meet the ordinary requirements, in order to guard against obstructions. Experience has proven, however, that all unnecessary size, above the requirement of capacity, is actual injury, since it greatly diminishes the scouring power of the current. The smaller the drain that will carry the largest flow with which it is likely to be charged, the better is the scour, and the more likely it is to be kept clean.

If, through carelessness or otherwise, rubbish, such as broken crockery, rags, etc.—which they are not intended to carry—find their way into sewers, no amount of increase in size will prevent their becoming choked, and decomposition will inevitably go on, generating a deadly gas next to impossible to exclude from our houses with the system of traps now generally in use.

"Drain pipes, whatever pattern be chosen, should be bedded in proper clay, and have the joints well luted; for if the joints be badly made, the liquid drainage will escape, and the sediment which is left behind may collect to such an extent as to choke the drain altogether. When drain-pipes are laid in cellar bottoms, it is a good plan to place them upon a bed of concrete, and cover over

with a few inches of the same material. Wherever the drain-pipes pass through the walls, it is wise to turn a relieving arch over them; for, if a settlement should take place in the building, the superimposed weight will in all likelihood crack the pipes, and cause the drain to leak at a most dangerous place, or perhaps break them, and cause the greatest annoyance.

When drains are laid in new-made ground, unless care be taken to ram the earth sufficiently hard round about them—and this is next to impossible—the pipes will open at the sockets, and sodden the ground in their neighborhood to a dangerous extent. It is best in such a case, to rest the pipes upon boards laid upon occasional piles, or what is better, upon piers of brick-work.

It will sometimes happen that drain pipes are laid in ground which may afterwards be penetrated by the roots of trees, shrubs, and strongly-rooted weeds. A cure for such an invasion of the pipe joints, which will infallibly lead to choking the drains, has lately been pointed out by Mr. Mechi, and that is the coating them over with coal tar, since roots will persistently turn away from this material.

A matter of paramount importance is the declination which is given to the pipes. If this be inadequate, stagnation will ensue, and a costly and troublesome flushing be repeatedly necessary. Inside a drain in use everything should be in gentle motion. If laid too flatly, the heavier effete matters are deposited and clog the way, and if the incline be extravagant the water will hasten away and leave the solid wastes behind. In a late work, a writer states that too great a fall cannot be given to a drain; but when the fall of the tributary drain has been in excess, that part of the main drain which received the contents of such house drain will be found almost choked up. Some authorities formerly recommended a quarter of an inch fall to each foot, but the best practice is to allow a fall of 2¾ inches or 3 inches to every ten feet.

Drain-pipes can be too large. Some people use nine-inch pipes throughout a house, and think it commendable, when a four-inch pipe would answer every purpose. A four-inch drain-pipe for sinks, back-yards, and basements, is ample. Even the closet-drains in a house need not be more than six inches in diameter. Six-inch pipes well laid will suffice for the largest house, and in the largest mansion nine inches will not be required until it is sought to carry the sum total of the smaller sized drains away in one channel to the sewer or manure-tank. Drain-pipes of too large diameter are incompatible with that steady onward movement of the sewage which every addition to the contents of the drain beneficially increases.

The junctions of the drain-pipes should never be of the right-angled kind; an obtuse-angled or curved junction should be used; in other words, the sewage should be delivered in the line of the flow of sewage. A T or L shaped delivery is very apt to cause a deposit at that particular part of the drain.

It is considered wise to give the drain a little extra dip wherever a bend or junction occurs in its length, in order to counter-

act the effects of friction. A very small amount of dip will usually suffice. In laying down a system of drains to a house, it will often prove beneficial and save much expense on some future occasion, if what is called a dummy junction be here and there laid in the march of the drain. The orifices of these junctions should, however, be stopped up with the disc-plugs sold for the purpose. A large pipe should never be delivered into a smaller pipe, or even into one of the same diameter. There should be a difference of three inches between the larger pipes, and of two inches between the smaller ones, for instance: twelve-inch pipes can deliver into fifteen-inch pipes; nine-inch into twelve-inch; six-inch into nine-inch; four-inch into six-inch, and two-inch into four-inch pipes.

Where a diminution in the drain-pipe is found requisite, the proper tapering pipes should be used; any other contrivance is at the best unworkmanlike.

A certain number of access-pipes will be often found useful if laid in a length of drain, say one to every ten of the socket-sealed pipes. Some pattern or other of these pipes, with a movable cover might wisely be inserted close to all angles, bends and junctions, and a well-hole built round them to facilitate inspection.

The pipes should be so laid in or about a house that the human ordure may enter nearest the sewer, or, what is the same thing, nearest the point of delivery of the house-drain or the disconnection arrangements. The wastes from the sinks should enter the house-drain between the closet delivery and the house; and the rain water, if not stored, should enter nearest to the house. By this means a persistent movement of the sewage is better obtained.

A flap-trap should be affixed to the end of the house-drain at its connection with the sewer or manure-tank, so that, if the sewer be surcharged at any time, it cannot flow up the tributary pipes, This contrivance will also tend to prevent a return of foul gases. An egg-shaped drain-pipe, laid from the disconnecting trap to the main sewer, secures the maximum speed of flow, and the minimum chance of any solid deposit.

DISCONNECTION, VENTILATION, ETC.

Having all the drain-pipes carefully laid with the proper declination from the outer walls of the building to the street, the next thing in order for consideration is, how best to arrange the discharge from the various departments of the house. The common method is to run the street pipes directly into the house, joining the waste pipes to them; but the consequences of such an arrangement are most disastrous, since the sewer air, when forced back in the pipes from any cause whatever, will be sure to find its way through the hydraulic traps and permeate the atmosphere of the entire house. A safer plan is to disconnect the waste pipes inside the house from the street sewers by allowing the former to discharge their contents into a chamber or tank, covered and properly ventilated, or what will answer equally well is a trap placed in the sewer, as near the outer wall as practicable, provided with a ventilating pipe, about

four inches in diameter running from it to the roof of the house, thus placing the poison beyond the power to do harm, and effectually preventing the passage of sewer gas into the house.

SUMMARY OF VENTILATION.

All waste pipes of the house are to be disconnected from the sewer outside by means of chambers, tanks, or traps, as near the outside wall as practicable, with ventilating pipes extending to the roof.

Rain water pipes should never be relied upon as ventilators, since when they are most needed they are performing their own specific duties.

The soil pipes of closets should invariably have ventilating pipes running from each trap to the roof of the building or into chimneys.

Every trap in the waste pipes inside the house should have a ventilating pipe, since even in waste pipes for the conduct of water only, the air will become foul.

The masses are slow to believe that the products of decomposition of animal and vegetable matter, generated in such small quantities that they cannot be recognized by the senses, can possibly give type and malignancy to disease. It is, however, a well known fact among medical men that an exceedingly small amount of sewer-gas, added to the natural causes which must inevitably surround us, may and does give a fearful malignancy to disease.

For instance, the natural causes with which we are brought in contact may produce diarrhea, intermitting and remitting fevers, catarrhal difficulties, etc., which are, as a rule, easily controlled and seldom prove dangerous to life; but if we add a very small amount of the product of decomposition to the causes which have produced the above named diseases, we shall have instead, typhoid fever, dysentery, and a host of other diseases equally dangerous to life. Hence, the vast importance of guarding well every avenue by which disease may enter our households, by giving heed to the warnings so frequently sounded in our ears concerning the present system of ventilating the channels that are intended as the conservators of health. "Verily, a man's foes are they of his own household."

The best means should be procured for flushing drain-pipes at least once a quarter, and the outlet, an access-pipe opening, or the point of disconnection watched to see that the flow is unimpeded. Some people flush the drains by removing the sink trap and allowing a cistern to be emptied through the water tap into the drains; but this is for the most part useless, and the very term "flushing" means the imparting of a rushing action to a body of water—at least that is the only effectual method of cleansing underground channels.

To provide an efficient quantity of flushing material where waterworks have not been introduced the rain-water may be stored in an upper or underground cistern; and when the drain is opened, the water having been caused by flowing or pumping to fill a large

tank above such opening, one side of the tank should be made removable so that at a given moment a thorough scour may be insured.

Proper openings for this purpose should be left in the drain, both below and above the point of disconnection; but these should never occur inside the house, as is but too common, for, as the water runs down, the foul gases levitate and invade the house. Sometimes a cheap disinfectant may with advantage be added to the flushing water. After this flushing, in all likelihood, any syphon traps in the line of the drain will be emptied, and it is necessary to pour a small supplementary supply of water gently into the drain before leaving it.

Should the drain from any cause be stopped up, which will be readily ascertained, a series of swivel-jointed rods, such as are used by chimney sweepers, but with a roller at one end, or a series of Malacca canes, screwed together, should be pushed up the drain.

It is here where the access pipes perform excellent work, since, if the rods or canes cannot reach the matted obstructions at one place, they can do so from another point.

A correct drainage plan, showing the different size of pipes used, the positions of bends and junctions, the site of syphon-traps and access pipes, the depth from the surface, and the nature of the ground, should always be prepared when the drains are first laid down. This may save much future inconvenience. Eassie's Sanitary Arrangements for Dwellings, pp. 21 to 27.

DISPOSITION OF SEWAGE.

That the rivers of a town should not be converted into vast cesspools, to breed poison for the slaying of its inhabitants, would seem too nearly axiomatic to require demonstration; and yet we find this to be the almost universal practice.

London poured the effete matter from its thousand sewers into the Thames till both river and atmosphere were reeking with sewage poison, and the horrified savans of Parliament were about taking themselves to some more favored locality when Mr. Bazalgette, a civil engineer of high repute, came to the rescue and devised a system of intercepting sewers which should carry this engine of death to a point whence the daily ebb-tide would take it out to the ocean.

Birmingham, in 1848, "expended £200,000 in constructing sewers with their outlets into the Rivers Rae and Tame, one of which is six feet and the other twelve feet wide. In 1858, the pollution had become so great that a chancery injunction was served upon the city to prevent the continuance of the evil."

Leeds polluted the waters of the River Ayre in the same manner till an injunction was served upon it also.

Manchester, with a population of 356,000, discharged its sewage, up to a recent date, into the rivers Irwell, Irk and Medlock, until they "became filthy in the last degree." Then came the Health Committee trying all sorts of expedients to abate the nuisance.

Notwithstanding the 200,000 francs, per year, which Paris pays for removing sewage deposits from the bed of the Seine, it is still so seriously polluted as to call forth repeated remonstrances as to its condition.

"The city of Dublin, with a population of less than 300,000 inhabitants situated similarly to Milwaukee, a river running through its centre, and all its sewers entering the river at various points along its quays or docks, was so afflicted with its bad odors and unhealthy emanations that various devices were suggested by engineers to rid the city of this great nuisance—such as covering the whole river, and constructing a grand boulevard—running a railroad down the centre between solid walls, and dividing the stream so as to increase its force and ability to scour the river, and various other methods.

"The London plan, I have been informed, is now settled upon, and tercepting sewers will soon be constructed, at an estimated cost of one million of dollars, to convey the contents of the main sewers, three miles below the city where it can be carried out by the tide to the ocean. The utilization of sewage has not as yet engaged the attention of American agriculturists, but it has for ages been used as the best fertilizer for worn and exhausted lands in Europe, and when properly prepared, is equal in value to the best guano. According to Mr. Norwood's account the meadows about Edinburgh have been enriched by the sewage of that city for 150 years. He says: 'The most effectual plan for cleansing rivers is to prevent by interception the influx of town sewage into them, and that sewage when kept in motion, either in the culverts, carriers, or on the fields, is inoffensive to the senses and uninjurious to health.'

"It may be thought by some that the small amount of filth entering the Milwaukee River, could not, for a great many years, be offensive or injurious to health. To suppose this is a great fallacy, when it is known that the amount of solid sewage, to each individual per day is 3 ounces, and of liquid sewage, 42 ounces. Estimating our present population at 100,000, there would be poured into the river, provided the privies, water-closets, and cess-pools connected with our dwellings were emptied into the sewers, nine tons of solid sewage and 126 tons of liquid sewerage daily, or, in one year, 3,285 tons of solid sewage and 45,990 tons of liquid sewage. As the population increases the nuisance increases.

"No one for a moment will suppose that this huge mass of filth deposited in a currentless river like ours can be inodorous and harmless. * * * * I think I have stated sufficient upon this subject to enlist the attention of my fellow citizens, and of the city government, to the application of the necessary remedy before more money is expended upon a system of sewage that will soon turn out to be a nuisance of the worst kind."

These words of warning and of kindly advice are from the pen of James Johnson, M. D., health officer of the city of Milwaukee (seventh annual report), and it is much to be regretted that the authorities of that city did not accept and act upon his suggestions and plans of intercepting sewers, since it would have saved what

will soon be rendered imperative, another immense outlay of money for sewerage.

DRAINAGE OF BUILDING SITES.

Statistics have proven that surface-water is one prolific cause of consumption and kindred diseases, yet how few examine the condition of the soil below the surface when locating their homes.

It is not that men are indifferent to the causes which produce disease, but because, they are so absorbed in their various occupations and professions that these primary considerations are lost sight of.

It is a fact well known to civil engineers, and others who have given the subject careful attention, that sewer pipes, absolutely impervious to water,act as drains to the soil in which they are laid, and if placed sufficiently deep, will, to a very great extent, remove the surface-water, thus rendering wet and unhealthy localities dry and salubrious.

Even the drying of soil in the laying of sewer mains in cities has led to a perceptible diminution of lung diseases in the districts where they were laid.

The first consideration in building a homestead, either in city or country, should be that the foundations be laid in ground that can be thoroughly drained. The drainage should be arranged after the best methods and with the greatest possible care that all the conditions of soil are perfectly understood. The house should stand upon the highest elevation in the plat of ground designated for the purpose, with south and east exposure if possible, and well removed from too much shade, since a superabundance of trees and clinging vines causes a dampness of the atmosphere of the house, that cannot be remedied by any amount of drainage, and this increases the pressure of the blood on the internal organs, lessens the discharge of water from the skin, and elevates the temperature of the body, thus causing congestions, etc. Let pure air and sweet sunshine have free and unimpeded access to every part of the house, thus insuring to its inmates health and cheerfulness.

See that the drainage is absolutely perfect, "else manifold evils may fall upon the loved ones."

Country homes should be supplied with every facility for the discharge of all the waste water and effete matters of the household, as these should be carried beyond the reach of harm to others, and at the same time so far removed from the well and cisterns that it will be impossible, by any percolation through the soil, that these should be contaminated. A sure way of avoiding any such contingency, would be to have closely cemented tile drains, carefully glazed on the inner surface, for the conveyance of all refuse matter to a distance of not less than five rods from the house, where it may be deposited in an open trench with grape vines surrounding it.

The location of the barns, stables, piggeries, privies, etc., should have regard to the water supply for drinking and culinary purposes, as well as to the house itself, else disastrous consequences may result.

"It has been truly said that no man is so poor that he need have his pig-trough at the front door, and if we cannot, single handed, drain a town, we can, at least, keep decent our homesteads."

"We see that the well are made sick, and the sick are made worse, for want of the two elements which a good God has given us absolutely without measure—pure air and pure water. From tooth-aches to typhoids, from the neuralgias and rheumatisms that keep us in torment and will not even let escape by death, to the fevers and cholera, which strike us down almost without warning, and even from consumption, slow but sure, we suffer in great measure because we breathe bad air and drink bad water. We see too, that often, if not usually, the air is poisoned by emanations from stagnant water, either that which is naturally in the soil or in pools and holes about us, or that which we have rendered corrupt by the ordinary and careless arrangement of buildings for our families and our domestic animals.

"The water of our springs and wells is corrupted by drainage from cess pools and sinks, so that we ourselves systematically poison both the air we breathe and the water we drink." Fourth Annual Report of the Massachusetts State Board of Health.

It is a common practice, in the country, to have the well, for watering cattle, in the barn-yard. This is a very pernicious practice, since the water—being necessarily impregnated with the juices, of the animal deposits—is as unfit for beast as for man. That the milk of cows is frequently poisoned by drinking bad water, has been proven in numerous instances.

After using every precaution within our knowledge to insure healthy conditions to our families, we are still largely at the mercy of our neighbors. For instance, the brook that sings through our meadows, refreshing man and beast with its clear, sparkling waters, may have in solution the effete matters of neighboring barn-yards, privies or slaughter-houses, thus pressing to our lips the chalice of death.

Let no man deceive himself with regard to the oxidizing and disinfecting properties of air and earth on such waters. An amount of exposure to these influences that would resolve the dead organic matters present in water into harmless mineral compounds, will certainly fail to destroy those constitutents which are the germs of zyomatic diseases. Germinal matter is only destroyed by death.

"The most recent experiments tend to show that we have been vastly overrating the oxidizing and disinfecting properties of air, water and earth. There can be no question of the fact that we are drinking water and breathing air contaminated by sewage and sewage emanations, and the fact is admitted that both air and water may be polluted to a dangerous degree without perceptible change in taste, color or smell. We must not deceive ourselves, because poisons do not 'slay like the sword,' because long habit gives us a certain kind of immunity from evil results, and because, in our new and sparsely populated country, we have a soil not yet saturated with the filth of centuries." Sixth Annual Report of the Massachusetts State Board of Health.

It is related that, "in Switzerland, the dejections of typhoid cases were cast into a running brook irrigating a meadow, filtered through a *mile of porous earth*, and reappearing as a spring, from which the people of a town drank. This acted as a source of the disease, and struck down more than seventeen per cent. of the inhabitants."

The Boston Journal of Chemistry, in an article entitled, "The Lesson of the London Pumps," says: "The good people of certain quarters of London have been much stirred up of late by the attacks of malicious sanitarians upon the reputation of the venerable town-pumps.

"A famous old pump at the East End, known as 'Aldgate Pump,' was the first against which these officious people, who want to interfere with the inalienable right of their neighbors to poison themselves, directed their spite.

"Now the water of this ancient well has a traditionary celebrity in the district; so much so that many of the inhabitants consider that a morning draught from it is a sovereign remedy for certain ailments, and send for the water from long distances when they feel 'out of sorts.' The flavor and appearance of the water are in keeping with its good name. It is clear, sparkling, and has a cool, saline, flavor which is very agreeable to the palate, and which is harmless enough when the saline ingredients are not accompanied by organic taint. In this case, however, the analysis made by Professor Wauklyn shows that the cool, refreshing flavor is due to the impregnation of the water with salts derived from decomposing sewage, which evidently finds its way into the well, partially filtered and decomposed by the surrounding soil. The soil itself is heavily loaded with organic matter, and does not form an efficient filter; thus the water is polluted with a considerable amount of organic matter. But, for all this, the popular feeling in its favor is so strong that resistance has been made, on the ground of certain 'city privileges', to closing the well, and it is said that an appeal to the home secretary will be necessary to prevent its further use."

This case led to an examination of the other London pumps, and Dr. Frankland states the result in a letter to the *Times*.

"Samples collected from all the known shallow wells in the metropolis, having been analyzed in the laboratory of the Rivers Pollution Commissioners, were proved, with but two exceptions, to consist chiefly or entirely of the soakage from sewers and cesspools, and some of them actually had a manure value 150 per cent. greater than that of average London sewage! One or two had a slight saline taste, piquant to some water drinkers, but most of them were bright and palatable, and the pumps yielding them enjoy, for the most part, as high a reputation with street commissioners as Aldgate pumps had had.

"These facts are worth recording as curiosities of history in this nineteenth century, but we allude to them mainly for the sake of emphasizing what we have more than once urged upon the attention of our readers, namely, that very bad water may not seem to be bad, but on the contrary very good, when judged by its taste and smell."

When we have once educated the people to an appreciation of the fact that a homestead built on undrained soil is the certain abode of death; that houses with their water-supply and privy-vaults in close proximity, are nothing less than highwaymen who watch for our lives; when we convince them that certain conditions either of soil or dwelling, will certainly produce death, then will they begin to understand and appreciate the importance of a thorough system of drainage as well as the proper arrangement of the water-supply of their buildings.

Ventilation of Public Buildings and Dwelling Houses.

BY JAMES BINTLIFF, OF JANEVSILLE,

MEMBER OF

THE STATE BOARD OF HEALTH.

VENTILATION OF PUBLIC BUILDINGS AND DWELLING HOUSES.

Great plagues and epidemics have ceased to ravage civilized communities, as was their wont, and the mean duration of life is steadily increasing. At Geneva, in the sixteenth century, the mean probability of life was under nine years; by slow steps, progress was made to fourteen years, in the seventeenth; thirty years in the eighteenth; and in this century, the limit is rapidly approaching forty-five years. The improvement indicated within three centuries, has resulted from advancing knowledge and more enlightened practices for the maintenance of life in health. This country has not kept pace with the better ratio observed in Geneva, mainly because there has been a lack of attention to the grand principles and essential details of sanitary reform. Dr. Rush was our only author discoursing on this pregnant subject prior to the year 1863, and it was not until six years later, that a State Board of Health was organized in Massachusetts, that being the first established in this country. Circumstances controlled the popular mind in other directions, while Europe was multiplying such institutions; and in consequence the vital statistics of that State compare unfavorably with the average of trans-Atlantic communities similarly enlightened. In estimating the value of life, it is important to ascertain how many days of sickness are included in the sum total of existence. In Europe the average duration of sickness for each individual, is a fraction less than 20 days per year. Massachusetts is divided into six geographical sections for the compilation of returns, supplying information similar to that collected by European boards of health; and from those figures we learn that the highest rate of incapacitation through ill-health, obtains in the Boston division, where the average is 24 days per year, or one-fifth more than the percentage exhibited in Europe. This does not result from any cardinal defect in the climate, as the Berkshire Hills division shows a total of only 14 days; or less than two-thirds of the European average. The whole State presents a total more favorable to health than the Boston division, the rate being 17 days to the year; but in that respect a marked decline is observable, the average for eight years, ending with 1872, having been only 14 days, or three days less per capita than the ratio obtained in the year last named. In this State we possess no statistics which will enable us to compare the individual results of incapacitation by sickness with the Massachusetts tables; but we may be sure that our loss approximates thereto. The money value of the labor lost in Massachusetts by sickness alone, has been estimated for one year, at $39,146,980. The reader will draw his own conclusions as to the figures which may represent our losses on that score.

Every man must die; but a large proportion of the sickness commonly endured is known to be preventable, so much so, that it is assumed that the death rate, which exceeds 21 per thousand per annum in Milwaukee, and 30 per thousand in Boston, could be reduced, with proper care, to 11 per thousand. Sanitary science offers means for the perfection of human government toward the point indicated; but we are slowly reaping its advantages. Ventilation is but one of many subjects which should command universal attention. Upon the realization of efficient ventilation depends life, health and happiness for untold millions who shall inherit this fertile land; hence it is impossible to overrate its importance. Two-thirds of all the funds now being expended in the maintenance of benevolent institutions, might with advantage be devoted to the procurement of better hygienic conditions for the classes from which our State institutions are filled with chronic misery, allied to physical and moral decrepitude. Prevention is barely possible with the means at our disposal; but once the operating causes have eventuated in disease, insanity and crime, no human instrumentality can effect a cure. A sound mind can seldom be discovered unless associated with a healthy body.

The major portion of the work to be accomplished must be devolved upon individuals. Culture, which means more than collegiate training, and does not necessarily include erudition, should produce perfect humanity; well developed in mind, body and estate, capable of perpetuating the best qualities of the race; and, therefore, able to appreciate all the circumstances that favor its highest development. Governments can only assist what the individual may directly accomplish. Associations, however wisely directed, must depend for their ultimate success upon the intelligence of the mass to which their representations must be addressed; and for the amelioration of which their organizations are intended. The hope of society rests on the growth of personal enlightenment.

EARLIER TRACES OF VENTILATION.

Five thousand year ago, when the plans for the pyramid of Cheops may have been in preparation, there was, more knowledge among the learned, as to ventilation, than we find to have been in existence among Anglo-Saxons a century since. The great pyramid had an arrangement for the ventilation of its interior chambers. The information implied by that provision, contrasts with singular force, when we consider that one hundred years ago in Plymouth Sound, within sight of two marvels of engineering work, the breakwater and Eddystone Light House, a man was permitted to sink himself in a strong box, in fulfilment of foolish wagers, because the scientific men of the time and the governing classes were alike ignorant as to the necessity for fresh air to maintain life. The death of that man remained an unsolved problem for many years. Egypt had no darkness to parallel such ignorance. Little more than a century earlier, the president of the college of physicians, in London, in an inaugural address, informed

his fellow physicians, that no one knew, nor ever could know, what purpose was served by the phenomena of breathing. Samuel Pepys records the fact, in his visit to Gresham College, in these words: "What among other fine discourse pleased me most, was Sir George Ent about respiration; that it is not to this day known, or concluded on among physicians, nor to be done either, how the action is managed by nature or for what use it is." Sir George Ent was a University graduate, a Fellow of the Royal Society and a leader among the scientists of his day. The question of ventilation was thus authoritatively placed beyond the realm of investigation.

The knowledge which the Egyptians possessed had probably come to them from a much earlier time, by intercourse with the highly civilized Ethiopian nation, inhabiting Arabia, Felix and the coast. The Greeks and Romans certainly possessed such information, seeing that the early temples of Esculapias were *Sanitaria* rather than medical schools, and that Hippocrates wrote the earliest hygienic treatise now extant treating of "Airs, Waters and Places." Means of disinfection were used at Athens during a plague; the agency of fire, which is only now beginning to be again recognized having been used by Acron of Crotona, with great advantage to the city.

Ancient Rome appreciated sanitary art and appointed officers to superintend the construction and management of buildings, public and private, to secure salubrity and safety. The Mosaic ceremonial laws, which had their origin in the enlightenment of the court and priesthood of Egypt, were founded upon correct information as to human requirements; and Moses regulated the food, purifications, ablutions and other necessary details tending towards the maintenance of the health of the Jews, who are at this time the most healthful and best preserved of all the races on earth. The Greeks cared as much for the physical as for the intellectual supremacy of the people; and in their cities, public baths were provided for the poor as well as the rich. The Romans imitated this feature of Greek civilization, and, also, following the example of that nation, Antoninus Pins initiated the appointment of medical officers, in Roman towns and cities, to preserve the general health. Health institutions now existent in Germany and Italy find their origin in the days of Antoninus. The buildings constructed for public baths contain provision for ventilation as well as for heating, which soon after the influx of barbarism fell entirely into disuse. How completely the scientific acquirements of the ancient world had been lost, can be seen dimly in the records of the dark ages, which may be said to have covered the whole earth, seeing that India, once a focus of enlightenment, witnessed the wholesale slaughter of prisoners in the Black Hole at Calcutta, by foul air, in 1756, because the authorities were ignorant of the laws governing ventilation. Among the common people there came to be a stupid horror of fresh air and the professional classes were too besotted by prejudice to lift their patients out of the mire.

NECESSITY FOR VENTILATION.

Human life demands fresh air, which must be in some degree pure. Eight parts of carbonic acid, to ten thousand parts of atmosphere, has been named as the maximum of impurity that can be endured without injurious consequences supervening. Unfortunately in most of our public buildings, schools among the rest. the proportion commonly obtained is five times as great as that indicated by science as the ultimatum. The body has a wonderful capacity to adapt itself to surrounding circumstances. When the lungs fail to purify the blood, the liver comes to the rescue and is proportionally over-worked. The fœtus supported directly from the circulating system of its mother and having no action of the lungs to cleanse the vital current, developes a corresponding proportion of the other organ, which, at the time of birth, is always largely in excess of the post-natal requirements of the system. With food of another class less prepared to sustain life, the breathing apparatus comes into operation, and the liver generally decreases in relative size. In later life the two systems of purification supplement each other. on the same principle, hence minor impurities can be endured without immediately poisonous results. Childred fall sick in over-crowded school-rooms and nausea relieves the stomach from food which the want of sufficient oxygen and the presence of animal impurities in the air, combined with carbonic acid has rendered noxious to life. Such incidents are too common to procure from the average observer such attention as they deserve.

It is not too strong an expression when we assert that millions of human lives have been, and are being, sacrificed for want of care as to this primal necessity of our being, ventilation.

The president of our State Medical Association, Dr. J. B. Whiting, in the last annual address to that society says, with much force: Our children are crowded into school rooms that have little or no ventilation except as the heat of summer admits of opening doors and windows. From fifty to seventy children are often kept in a school room by the hour when the supply of fresh air is not sufficient for one fourth that number. If any one doubts this, let him visit the primary departments of the schools in this state at a season of the year when artificial heat is required, when doors and windows are closed, and he will find the atmosphere of the room not simply impure and oppressive but offensive and disgusting to the sense. and his first impulse will be to escape. If he remains, the offended sense soon ceases to protest and the visitor breaths the contaminated air with seeming impunity. But the little ones, who are compelled to live in such an atmosphere day after day and month after month do not thus escape. The more robust live through it; but the delicate ones succumb to the poison and fall out of the ranks."

Happily this subject is now commanding attention in every part of the Union. Men remember the quaint saying that, "our fathers who lived in houses of reeds, had constitutions of oaks; but we, who live in houses of oak, have constitutions of reed." The

sentence serves to arrest the thoughtless to a grave subject, although it is untrue in its essence. The men who in hyperborean regions would attempt to discharge the functions of life in houses of reeds, would not transmit it to their offspring constitutions of oak. The house must be well constructed for shelter from the elements, as well as for ventilation, if the highest purposes of life are to be aided by urban existence. The latest results in vital phenomena sustain the story of the ages that, with every century of civilization there is a large appreciation of individual endurance; a fact that directly contradicts the existence to which we have referred. The house of reeds was, in many respects, as ill ventilated as the most compact dwelling house of to-day; and where the largest fires were maintained it was barely possible for the resident, perpetually revolving before its blaze like a spitted turkey, to thaw one side of his refrigerated body before the other had become frozen. Between the two styles of dwelling there is merely a choice of evils; but with the houses of to-day, ready to our hands, systems of ventilation may be devised which will cheaply and greatly enhance the comfort and duration of life.

A human being requires, at the very lowest estimate, 350 cubic feet of air for every twenty-four hours; and the authorities assert that 360 cubic inches per minute is the quantity demanded for the respirating process by every healthy adult.

The requirements of children are but little less. Air that has been breathed is rendered unfit for further use, temporarily, because it has lost a portion of its free oxygen; has become charged with carbonic acid to one hundred times the former volume of that ingredient, and has become impregnated with an animal vapor such as offends the nostrils in every crowded room. The presence of carbonic acid is made the test of impurity, but animal effluvia constitutes a terrible factor of sickness. Could some process be devised to separate the vile components from the better air, as we winnow the chaff from grain, without exposing children and adults to the breezy process used as an illustration, that would be the sum of excellence in ventilation; but no such scheme has yet been put into practical form.

The best devise only aims at diluting the foul air confined in an occupied room, by the introduction of currents from the outer atmosphere; hence, a much larger supply than is needed for breathing is necessary for the preservation of health. Evidence has been accumulated from many States illustrating the evil consequences of breathing impure air. One authority says, after twenty years study of the subject, "many cases of consumption, heart disease, and kindred evils, originate in the foul air of school-rooms and other crowded places. Dr. McCormac contends that consumption and all tubercular diseases result from breathing air already vitiated by respiration. Life cannot be enjoyed nor realized in its highest excellency, unless a sufficiency of pure air is supplied at all hours, sleeping and waking, and the scholar or literary man, whose sedentary occupation and brain labor makes special demands upon the vital power, should be in an exceptional degree cared for by a supply of oxygenated air.

DEFECTS OF PUBLIC BUILDINGS.

"France wants good mothers" was the doctrine of Napoleon, reviewing the necessities of his empire. That want must be realized by every nation and is theoretically recognized in this country; but our school system, which is oppressive to both sexes, is specially injurious to girls at the age when they are approaching womanhood. Excessive labor, mental or physical, imposed upon children, retards and deteriorates developement; but there are seasons when the brain work of the school room would alone prostrate the nervous systems of our girls; yet it is a fact within the knowledge of every expert, that our school buildings appear to have been constructed with the express design to superadd physical exhaustion to the other destructive forces that threaten the lives of the future mothers of America. Dr. Clark says: "the sick chamber, not the school room, the physicians private consultation, not the committee's public examination, the hospital not the college, the workshop nor the parlor, disclose the sad results which modern social customs, modern education and modern ways of labor have entailed on woman." Dr. Fisher says: "for the sake of a temporary reputation for scholarship, girls risk their health at the most susceptible period of their lives and break down after the excitement." These opinions glance at our modes of education only; but the ambition of school boards to erect showy buildings, the architectural proportions of which shall tower above surrounding edifices, compels the young to ascend and descend interminable flights of stairs, day after day, thereby terribly increasing the pains and penalties which are exacted by our educational experiments. It is well that bodies should be developed as part of the educational process; but stair-climbing is not of itself, a desirable accomplishment; and physiological reasons, unanswerable in their force, argue against the continuance of the perilous practice.

In great cities it may not be possible to build the suits of rooms necessary for school purposes in structures of one story; but even then, it may be worthy of consideration whether suburban sites, easy of access, may not with advantage be substituted, where all the training of the lyceum can be afforded on one floor, in houses not too high to permit of their being readily warmed and ventilated, cheaply and well, nor too expensive to allow of sufficient floor room being given to each individual. Another generation than the present, will conclude to use the pretentious school buildings of to-day for other purposes in which adult humanity is concerned, so that our girls may have a fair opportunity to develope, into the strength and beauty that are essential to the fruition of maternal solicitude. The expense involved in the additional outlay will prove a bagatelle in comparison with the gain of health and vigor to the community. Systems of schooling do not fall within our province; but the construction of edifices in which the business of training shall be carried on is of paramount importance, upon the evidence before us, when we contemplate the physical wrecks which have resulted from the continual stress on muscle and nerve involved in

our efforts to extend the blessing of intellectual culture to the rising generation. The brain, abnormally excited, affords no compensation for a debilitated frame. The extra demands made by cerebral development tends only to exaggerate the suffering incidental to an unwise stimulation of mental power.

Proper ventilation is impossible, unless our buildings are so constructed as to permit of the best processes being carried out in their integrity. Many of the finest buildings in this country, considered merely as architectural beauties, are uninhabitable during winter in consequence of defective managements for heating and airing the several apartments. It is doubtful whether any process yet in operation fully meets the demand for ventilation; but probably the Ruttan system, which comes nearest to success, may, after a series of tentative experiments, become sufficient for all purposes. Mr. Leeds, in the *Sanitarian*, presented a plan for which he received a premium at the Vienna Exposition. The veteran architect insists that sunlight and its substitute, warmth, are absolutely essential to all natural systems of ventilation; and, of course, none other can be effected. The best contrivance will be that which utilizes within doors the forces now operating on the earth's surface, by the winds in their circuits and the suns rarefying power to remove impurities from our dwellings. He would have the floors and walls kept warm and he claims that cold air for breathing would not, under such circumstances, be found hurtful. With all deference, we believe that the pupils would attain better results, supposing his design reduced to practice, if the atmosphere as well as the dwelling itself could be brought to such a temperature as the sun gives at noonday in autumn. It is indeed too true that in many buildings, private as well as public, upon which large sums have been expended, a difference of from 12° to 15° may be found between the heat of the room at six feet from the floor and that of the floor itself. Not long since a teacher said, when speaking of a very costly structure, that the children taught therein must stand upon their heads if their feet were to be kept warm and their brains cool during tuition. Scarcely any man has ever sat in our average public buildings without realizing a similar condition. We are constantly reminded that the blood circulates more vigorously and that our nerve force is greater when we are surrounded by a warm atmosphere, and Mr. Leeds' suggestion that the walls and floors should be kept warm by express design, would operate still more beneficially by volatilizing the foul accretions which tend to adhere to cold walls and the lower stratum of atmosphere in our rooms.

The Ruttan system aims at making the house breathe; that is the design of the best process yet submitted; and, if it is not invariably successful, it is not for want of a correct appreciation of the great purpose which the architect should keep in view. The ventilating shaft, constructed in the center of the building, is traversed by the smoke pipe, which serves for the whole structure; and this, by its warmth, compels a current of air, such as it is claimed will not fail at all seasons to carry off the atmospheric impurities col-

lected from all parts of the building. The furnace, admirable in construction, sends its super-heated smoke over the building to radiate warmth before it departs by the flue; and the warm-air pipes convey to registers in every room a supply of heated pure air from without. Over the furnace is a continuous warm-air flue which can be tapped by the teacher to supply any lack of atmospheric freshness which the registers may not fill. After the heated air has passed through the building, traversing under the floor, specially raised for the purpose, through the partitions and over the ceilings, so that all the advantages of the Leeds scheme have been attained, the foul air having no outlet but by the shaft already described, must return to the basement of the building, radiating in its travel the last degree of its available caloric before passing through the tall chimney into the upper region of the atmosphere. Objectors to the system, as now operating, contend that, when contrary winds prevail, the foul air is liable to be forced back in the building with results disastrous to comfort and that the draught does not operate on all the rooms alike. It is even said that some rooms in well constructed buildings have altogether failed to procure ventilation under certain conditions. It has been suggested in reply that the inconveniences deprecated as likely to result from contrary winds may be minimized or removed entirely by increasing the height of the conducting shaft and the temperature therein. The answer seems to be conclusive. The second objection that some rooms are not ventilated at all, or partake in the general advantage insufficiently, may be found on further experience to require graduated escape pipes traversing the common flue, adapted to carry the foul air from each story; but a matter of detail so small as that need not be discussed in this article, as the company concerned in introducing the system, confessedly the most successful, will not fail to adopt every substantial improvement.

Ample experiments have demonstrated that pure air may be introduced into a room either at the top or bottom as may be most convenient; but the foul air should always be removed through the floor or on a level with it, and conducted to some central reservoir at the base of the ventilating shaft. The French architects, who have paid special attention to this subject, object to conducting the foul air from each story of a building upward to where the separate foul air flues unite above the ceiling of the upper story, because for this method a greater length of flues is necessary to accomplish the object; but, in cases where it is deemed desirable to carry the vitiated air from each story directly into the ventilating shaft, then this shaft must be divided into as many distinct compartments as there are stories in the building.

Ventilation during the summer can be secured by the same system of house-breathing by causing a fire to be ignited at the base of the foul-air shaft. The current of air thus caused will afford thorough ventilation with cool air, without the necessity to open one window in the edifice. The advantages accruing from the exclusion of hot air, dust and insects need not be enforced. We

would have the main expense incurred in the preparation of school buildings devoted, not to adornment, much as we admire beauty, and value its æsthetic worth, but to the procurement of efficient ventilation at all seasons and healthful warmth in winter.

Reference has been made to the necessity for additional floor-room in school buildings; and in some degree the same want is experienced in all public buildings. Many persons suppose that if the requisite space in cubic feet is given for each individual, it mattars not whether it is supplied in height or in breadth. No error could be more pernicious. The breathing room of the individual must be comparatively near to his own level and unless it is sufficient to protect him from breathing the impurities emitted from his own and the neighboring lungs and bodies, he cannot fail to be poisoned in a greater or less degree by the noxious effluvia which every animal emits. The number of diseases arising from this cause cannot be stated; but evidences go to show that hundreds of thousands of lives are thus annually lost. The most moderate space assumed to be compatible with the maintenance of health is 25 feet of floor space and 300 cubic feet of air space with the proper ventilation for each pupil. With this amount of space ventilation can be secured, and the proportion of carbonic acid kept down to the standard required for healthful action, by having means for the introduction of pure air equal to 10 or 12 square inches for each person to be supplied, and with egress flues for the vitiated air of fully equal capacity; but to accomplish this the difference in temperature between the air in the ventilating shaft and that in the rooms of the building must be such as to secure a motion equal to supplying 3,000 cubic feet per hour for each person. When that provision has been supplied the stigma will be removed from our school system that it causes three-fourths of all the cases of lung disease known to prevail among children.

IMPORTANCE OF THE PROBLEM.

It is not easy to overrate the magnitude of the subject submitted for consideration. The court house, the legislative chamber, the public hall, are important, because therein the laws, the administration and the beneficial amusements of the people are dealt with; and it is necessary that health should be compatible with the discharge of all our duties and the realization of proper pleasures. The ventilation of churches should receive ten fold more attention than has been given; but, in such buildings, the time spent by the average worshipper is small during the several services. The school should command the first and largest meed of vigilance, because therein those who are helpless require our protecting care, and upon the fulfillment of our obligations to them will largely depend not only their happiness and health, but the future prosperity of the nation. The boys and girls of to-day may be the fathers and mothers of many who will witness the next centennial celebration, and the highest product that we can offer for the approbation of the world is a better citizenship than that which ushered in

the display in Fairmount Park. It is not enough that we can send the work of our looms to Manchester, to be sold in the home of the cotton trade from which all nations were once supplied. We must be able to show that our free institutions and numberless advantages have attained for us commercial, inventive and manufacturing pre-eminence; because of the nobler manhood builded on this continent, in token of our thankfulness to Almighty God for the manifold blessings wherewith He has surrounded this nation.

NOTE.—This paper is designed as an introduction to the subject, rather than a discussion of either branch of its title.

MENTAL HYGIENE.

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MENTAL HYGIENE.

What shall we eat, what shall we drink, and wherewithal shall we be clothed? are fundamental questions which must be rightly answered in providing for the body. Fortunately, in the large sense, nature suggests answers.

But when we set about providing aliment for the mind, the problem becomes exceedingly complex. How much, what kind, and how to be administered, are among the leading questions of the age. It is not easy to know how to grow strong, long-abiding bodies. It is much more difficult to know how to grow strong, enduring, useful minds.

On the whole, bodies are underfed. On the whole, minds are in a state of starvation. The reason both are not in a state of starvation is, that the body when hungry, cries out for food, and will have it by means fair or foul; while the mind, without food, becomes torpid, and freezes to death without knowing it.

It is not the purpose of this paper to discuss the essence of mind, nor its relations to matter, except through the more common or coarser analogies.

When shall we begin to feed the mind of a child? Obviously, when it begins to show signs of capacity to digest ideas or notions. This digestive capacity may appear very early, or it may be delayed. Doubtless most children may be taught many useful things, at six months, especially may they be taught obedience. Woe to the poor mother who postpones such teaching too long; contempt, caprice, and slavery are her inevitable doom. Few young children are ungovernable, if judiciously handled; but if contests become frequent—if force has often to be met by force; if will has often to be pitted against will—you may better abandon the contest and trust to time, and the development of mind and a higher moral sense—better almost anything than frequent collision.

When shall a child be taught to read? When the broomstick, and the doll, and old Mother Hubbard, and Grandma's stories have lost their zest, and the child becomes restless and begs for "something to do." And it matters little at what age, or what may be its physical condition. Give it food. And the little ones whose mothers are neither so ignorant, nor so burdened by poverty and care, nor so oppressed by the frivolities of fashionable life, but that they can take them in their arms and feed them are "thrice blessed."

Nature begins to help the little ones' right early—to determine what is good for the body. Taste says sweet—and the body approves. Taste says bitter—and the body rejects. Not so with the mind. It hungers—but knows not sweet. It hungers—but knows not bitter. It will feed on garbage and grow. The body can eliminate what does not subserve its purpose, the mind can not. Woe

to the parent, woe to the teacher, woe to every one who gives it unwholesome food

No age can be fixed when systematic teaching shall begin, but it should begin early—if possible it should begin at home. The young brain is too receptive, and has too little power of discriminating, to be trusted to large, or doubtful associations. Hence the great utility, if not necessity when practicable, of keeping it within the sphere of loving hearts and judicious tongues, until it has acquired a habit of right thinking and correct behavior. Then, when it falls into the great march of life, when it adopts the street and the rough of the school—the little brain, preoccupied by the loves, and thoughts, and humanities of home, will resent the intrusion of evil thoughts and vicious ways. And although the conflict of the following years may be sharp, and the victory at times doubtful—yet shall the home bulwarks be impregnable.

But the time has come, when the most of us must entrust the mental weal, and in some measure the moral health, of our children, to others. Pity the parents whose hearts do not throb, whose eyes do not grow dim, as they launch their little ones upon the sea of life.

The common school is the crowning glory of the age. Doubtless it is the world's highest expression of civilization. With us, teaching the young is largely entrusted to women, and for obvious reasons, wisely.

Are our schools doing their utmost to give mental strength to our children? The writer enters upon the consideration with some misgiving. Nevertheless, he has fault to find. Of the system of books he makes no complaint. The steps from simple to complex are many, gradual, and natural. But the demands made upon the pupil are arbitrary, excessive, and unnatural. The personality of the pupil is ignored. The class is a machine that is presumed to be able to do a certain amount of work, and so its task is set. The individual pupils are assumed to be parts, each perfectly fullfilling his function, in making a perfect whole. Now if all these parts had been made of the same material, had all been fashioned by the same wise and skillful hand, the expectation would not be extravagant. But such an assumption is so notoriously untrue, that it may seem unnecessary to state it, and yet class training proceeds upon the theory that it is true. Undoubtedly all brains can do some work, and so can all muscles, in a sound condition; but it is never safe to assume that either can do a given amount of work, until proven by individual experience. Class work takes no note of natural endowments. Class work takes no note of mental aptitudes. Class work takes no note of physical condition, but pushes all forward into the same column and demands of all the same day's work. No ambulances for the foot-sore—no stretchers for wounded brains—no light for dim eyes—no hints to beclouded minds—no better way to the uncertain, struggling brain; but all, shoulder to shoulder, must reach the same goal, at the same time, or sink by the way, humiliated and disgraced.

Such is not the way to break colts. Such is not the way to educate brains. But it is a most excellent way to disorganize, discour-

age and make them trifling, and of little worth. The object of education should be to make healthy, sturdy, robust, symmetrical persons, which cannot be done when the individual is subordinated to the class. Most, if not all, brains at times need help, which the present class system almost entirely ignores. It is not meant that natural aptitudes should be so regarded as to make them the foundation upon which education should be based. The object being strength, solidity and dexterity, it may be necessary to repress tendencies, and to stimulate and develope weak points. Aptitudes will declare themselves, whether we will or no, in after life. But the aptitudes of some should not be made the standard of excellence for all. The class system must, under our system of education, in some measure continue; but its wrong tendencies can be largely mitigated or entirely remedied by an increase of instructors, so that the person will not be lost in the class. If it be urged that an increase of teachers demands increased expenditure of money, the statement may be doubted. Increased facilities would shorten the time of schooling necessary; but, if the expenditure of money should be more, can it be doubted that the fuller and more symmetrical development of the individual would be more than abundant compensation.

A very general opinion obtains that our children's brains are being overworked, and that their bodies are underworked. Neither opinion is well-founded; indeed, there is little hazard in saying that the reverse of both opinions is true. Both minds and bodies enjoy certain kinds of activity. The body enjoys play—the mind enjoys a certain kind of intellectual vagrancy; and so both have a tendency to be busy in these ways, but neither enjoys persistent, coherent, useful work; and yet, such is the very kind of work that must be done to make useful men and women.

Children are not required to do too much intellectual work, but under the present system (the class) they are often required to lift impossible weights. Oft-repeated unsuccessful efforts to accomplish a given intellectual result will as surely injure the brain as unsuccessful efforts to lift a weight will injure a muscle. Hence the imperative need of individual care. Doubtless, too much and too great a variety of work is often required to be done in a given time, but too much work, on the whole, is not required.

Special excitants, applied to the brain to induce it to accomplish its highest possible work, are of more than doubtful utility. This applies to the entire system in schools, high or low, of marks and prizes, honors and contests, whether at home or abroad. The system is pernicious in a variety of ways. It stimulates the delicate, active, highly organized brain to overwork, under the pressure of which some are injured, and some break down. It engenders in those who win, self-confidence and expectations seldom realized in after-life. Those who have made a vigorous struggle are humiliated, so that while few rejoice, many mourn—while the incapable or lazy multitude, for whose advantage the contest was organized—whose brains it was hoped would be galvanized into life—soon discern their hopelessness in the race, and gallop over the course at

an easy pace, quite satisfied to save their distance. It is a contest to which after life furnishes no parallels. In the struggle of after life, you win, because you advocate a better cause than I; or, because you are more diligent in business than I; but you never stand before me and say, "I will win because I am a better man than you."

"Inter-collegiate contests!" When shall we have organized an inter-collegiate contest of prayer? The blasphemy of the one is apparent. The evil effects and bad taste of the other ought to be equally apparent. If sports which are called manly, in which supremacy is the essential element, are of doubtful physical utility, (and they are so regarded by most physicians), how much more doubtful is the contest of mind with mind; where victory, and not a cause or a principle, is the essential element in the struggle. The morality of such a contest, the moralist is left to settle.

Children play too much, too long, and too hard. A field of colts, where the companionship is constant, may be trusted to take care of themselves. The rivalry will not be too much for their healthful, physical development; but he would be an unsuccessful breeder, who should turn into his field, a well fed, rampant colt, fresh from the stall, morning and evening, to excite the flock into greater activity. But children in whom struggle for supremacy is one of the earliest manifestations, are supposed to be the better for an almost limitless amount of play, forgetting that their brains are too much for their bodies. And so they are left to bat and ball, and shinny; to pull-away, and hide and seek, until through exhaustion, they fall an easy prey to disease, which always stands ready to assault the weakest point of the physical citidel; and more—it may be safely stated, that no exhausted body contains a rested mind. Severe physical and mental labor go not harmoniously together. Few can bear the strain of both. A physical and mental athlete is possible; they are not common; so that if we would obtain the best possible mental growth, we must not overtask the body. A verification of the above statement, will come from any mother who has carefully watched the mental training of her own children.

It is not intended to undervalue air and exercise in maintaining a healthful condition of body and mind. Nature's demand for both is imperative. In both growth and repair, it must ever be borne in mind that even the process of digestion is not completed when the food leaves the stomach—not completed when it reaches the blood—but must be laid down in bone and muscle and nerve; and that this, to be perfected, requires absolute physical labor.

A practice obtains somewhat widely in our common schools, which, although pertaining more especially to the domain of morals, may be noticed in this paper. It may be called the system of self crimination. The chiefs of the school establish a code or a system of rules. They are numerous; some of them are very high and some of them very low. The need of some of them is quite apparent; the need of others not quite so apparent; and unfortunately those that are not so apparent are the hardest to observe. A penalty attaches to the violation of each rule, and the pupil is

required to report his own misdeeds, and is rarely allowed to cite extenuating circumstances. In this the high court of school differs from all other earthly tribunals. The reason assigned for the requirement is, that it will cultivate in the pupil a high sense of honor. Now, doubtless every human being should carefully police his own conduct, and yet in making up his account for the day, he has a moral right to consider extenuating circumstances. This the child is denied, and he knows it is not fair play, and he mentally and morally revolts.

But this is not all, nor worst. The children will neither keep the rules nor report their violation; but, long before the years of school life are past, will begin slight prevarications, which is the highway to lying. The whole system may be fairly characterized as an ingeniously devised scheme to make liars of us all.

Proceeding to a more general consideration of mental hygeine, or health, it may be safely affirmed, that no great possession will be employed to the utmost advantage of its possessor, unless it be known and appreciated by its possessor. This statement is made with a full appreciation of the great endowment, and perfection of instinct, with some reason superadded, if you will. No good dog says, I have great instinct, or small reason. The conscious "I am," is the exclusive heritage of man and those above him. Conscious mind is his great inheritance. It is his only characteristic. It is his fortified citidel. It is his tower of strength. It is his inner sanctuary. It is his holy of holies. Having the great possession, what shall he do with it? On the answer to this question, rest all that shall make him useful, and great, and good, or make him a curse to himself, and mankind. If he answer this question wrongly, it were better for him had he never been born; and the answer rests largely with himself. In childhood and youth, the answer is mainly with others. In after life he alone can answer it. The advantage flowing from a high appreciation and use of this great possession, all will admit. The evils following a bad use of them, all will admit. But to the evils consequent upon a disuse of this great gift, our eyes are only half open. It is safe to affirm that a large proportion of the ills of life come from a disuse, or misuse of this power; and yet every man holds in fee, what, if well employed, will make him richer than gold, and happier than diamonds. Why has he not discovered, and mined his own possessions? Because state-craft, and priest-craft, and caste-craft, and gold-craft would not have it so. An educated brain is a bad tool. It cuts the hand of him who attempts to wield it.

Civilization of necessity brings with it a certain amount of mental activity, but does not of necessity give large intellectual development. Unfortunately, it puts within easy reach of the uneducated, its vices; and the less the brain is developed, the more alluring are those vices. The mental activity is generally carried into the vices to give them pungency and zest. The vice of intemperance would lose its relish, if its good-fellowship, its song and jest were eliminated from it. Take the social element out of drinking; compel every man to buy his own drink, as he would buy a box of

matches, and go home; and in two years the evil will be nine-tenths cured. And it may be said generally, that a certain amount of intellectual activity enters into all of those social gatherings, which eventuate in worse than a waste of time. Mental activities once developed clamor for food, and will have it; and if they are of a baser sort, will run on, and on, to the end. The same is true of all ignoble aptitudes and passions, unless met and checked by some sudden and powerful moral impulse.

Civilization lifts up her head in triumph, in the midst of her great achievements in science, and art, and literature, and glories chiefly in her noble charities, wherein science and humanity meet together and kiss each other; but bows her head in sorrow and shame, as she contemplates her penal codes, and her prisons. She does not seem to have considered that a condition of society is manifestly possible, when those great charities, and these great penitentiaries may become almost unnecessary.

Our great republic boasts of her civil and political equality; but puts not forth the requisite effort to make them a blessing to herself or her children. Now, the only possible means through which political and social evils, including poverty and dissoluteness, and crime and sickness and insanity can be reduced to their minimum, is through the mental development of the individual. The best methods to be employed to accomplish this result it is not the purpose of this paper to discuss, but that it should be done, is an imperative necessity, if we would secure the highest welfare of the individual and of the State. It is just as necessary to the well-being of the individual that every faculty of his brain should be developed as that his muscles should be put in motion. This may not be at all necessary to secure what is commonly called "success in life." A few sharpened faculties may pierce through many obstacles to the desired goals, but this will not, of necessity, make either a great or good man. A thoroughly educated and thoroughly dissolute or vicious man, if one can be found, will be an anomaly. The reason is obvious. He has grown appetites in other directions that demand food, and it takes all his time to forage for them.

It was said, in another part of this paper, that a large proportion of the evils of life come as a consequence of the disuse of mental faculties. That "a wise man foreseeth the evil and hideth himself" is as true to-day as when written, and so the question of the age is, How shall we be made wise? Parents guard the physical welfare of their children with jealous care, not that they may become stalwart, and so be able to thrash their neighbor's children; but that they may be able to resist the vicious elements in nature that surround them, and so grow up in the full physical enjoyment of life, and thus become useful members of society. So should it be in the education of our children; not to make their education a badge of distinction; not to relieve them of life's struggles—but to give them so goodly a heritage that they can rest at home, secure against the temptations that lead to unhappiness and dishonor.

It is sometimes said that higher education makes men impractical—that they do not succeed in life. Who is to decide, what is

success in life? It is not likely the position can be maintained; but if it can, it is not the fault of education, but of the individual in whom it engenders unjustifiable expectations. He has put on his education as a badge of distinction, and so is distinguished for his folly. The remedy is in making higher education so common, that it will cease to be a badge of distinction.

There is another feature of the subject, properly belonging to mental health, upon which the writer enters with some hesitation; not because his suspicions of the truth of what he may say, fall far short of profound conviction, but because he has not the statistics at hand to fully verify them, viz: That insanity comes mainly as a consequence of disuse, instead of overuse of brains. Any careful observer who walks through the wards of a hospital for the insane will be impressed with the apparent want of intellectual development of the great majority of its inmates; and on inquiry he will find that the proportion of those not possessed of the rudiments of a common education, is very large. He will also learn that the proportion of those tolerably well educated is very small, of those who enjoy books still smaller, and of those whose mental discipline had at any time of life been thorough, very few indeed. Doctors and lawyers, and preachers will be there, but to be either or all, is not a sufficient guarantee of having had either a sound mental or moral training. But the inquirer will be more surprised when he learns the occupations of the great mass of inmates. The proportion of farmers is enormous. Indeed farmers and housewives, and housekeepers and laborers furnish the great mass in many of our great hospitals. Of course the proportion varies as the agricultural or other interests obtain in different States and localities. But what is especially noticeable is this, that those avocations commonly understood to be, and which are in fact specially healthful, are furnishing so large a proportion of the insane; and this is still more remarkable, when we reflect that insanity is now, almost without exception among specialists, believed to be a consequence of physical disorder. Statistics make the conclusion almost inevitable that those avocations requiring the least intellectual development, although they are healthful, furnish more than their proportion of the insane. Even intellectual activity in a limited number of directions, seems a partial bar to insanity. Even the poor sewing girls, whose daily toils press sorely upon their physical constitutions, have a very small representation. Inventors, whose mental activities in given directions are intense, and their disappointments constant, have a very limited, or no representation; and it will appear through the entire list of occupations, that those which require the most mental strength and activity are least likely to break down. But if statistics should prove that the statement is not strictly true, it would not even weaken the other proposition, namely, that most of the insanity comes from disuse and not overuse of brain power; for if a man goes into the competition of life, and risks his success upon the superior strength he may display in his little finger and breaks it, or paralyzes it, it is no proof that he would not have succeeded if

he had used the strength of his whole body. The simple truth is, we march out into the thick battles of life without reserve corps or a base of supplies, and some of us are wounded, some crippled, and some annihilated. Our brains should be our base of supplies—our impregnable fortress. If they are not, then we have none.

But what shall we do with heredity? A large proportion of the insane have insane antecedents. Is heredity a hell-gate against which no power can be successfully projected? We do make successful war against heredity in other directions. If heredity had been an impregnable fortress, we should all be savages today! If we wound an arm, we put it in a sling, and use other members of the body, until it rests itself well. The same physiological law holds good in relation to the brain. Every physician understands this law, and when his friends are overwhelmed by a great sorrow, gives them something to do, and something to think about, that the wounded spirit may have rest. Alienists understand it, and so object to isolating hospitals for the insane. They would locate them in close proximity to towns, where they can feed some faculties through eyes, and ears, and so rest the disordered members, through diversion; but unfortunately the great majority of the insane, have no mental appetite—no mental stomachs have been grown that can digest food, and so they must be left to find their way out or perish utterly.

The world has many schemes for securing the welfare and highest happiness of mankind. Some of them are formulated and enforced as panaceas. A formulated and coerced faith may have the power of momentum, but it will never secure personal development, good conduct or purity of heart in the mass of its adherents. If a dogmatic and coercive religion had been enough to secure the highest well being of the race, mankind would have been, long centuries ago, on the highway to the zenith of its power. It is not intended to undervalue the beneficence of religion upon mankind or the individual, especially of Christianity; for, to deny its triumphs for good would be to falsify history and common observation.

Nor is it intended to deny that heights of moral grandeur are sometimes attained by the very ignorant, that stand forth a prophecy and hope to the race; but what is meant and insisted on, is that any formulated statement of religious or theological truth, the acceptance of which is made alike obligatory upon all minds and all consciences, plants in the very center of both mind and conscience, vitiated seed that must in the end eventuate in partial loss of mental and moral health; and, more than this, all organizations, whether political or civil, whether social or religious, whether open or secret, that do not make the highest practicable development of every individual soul their chief corner-stone, will ultimately fail of great results, and the highest possible good.

Foods and Domestic Beverages.

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FOODS AND DOMESTIC BEVERAGES.

The importance of taking such food and only such as is proper for us, will become manifest when we consider that our whole being is nourished by the ingestion of the nutritive principles of what we eat. Much also depends on the time and manner of taking food and the quantity taken at a given time; also, on the nutritive quality of the food itself. After adult age the quantity of food should compare as nearly as possible to the waste of the body; and for this reason the man of active habits will, all things being equal, require more food than those who live a sedentary life.

In this bustling age of ours, where the man of business grudges the expenditure of minutes as a miser does his pennies, many evil results follow the practice of eating too fast. The food enters the stomach imperfectly masticated, the digestive forces are overtaxed, and if presisted in, such a course must lead to such derangement of health and the proper nutrition of the body, as follow a dyspeptic habit of the system, I say *habit* because a long experience has taught me that most dyspeptics can be restored to health by establishing a proper time and manner of taking their daily food. This haste in eating should be guarded against at all times, and no portion of food of whatever kind should ever enter the stomach until it is perfectly masticated.

Many, nay most, people eat too much. The hasty eater is especially liable to fall into this error. The sensation of hunger does not depend on any peculiar condition of the digestive organs, as was formerly supposed, but by the demand of the whole animal organism, when its supply of nutrition is exhausted. The hasty eater entirely ignores this fact, practically, and by rapidly filling the stomach with improperly masticated food, arises often from the table with a feeling of oppression and fullness of the stomach, which distress would have been avoided if he had spent a few more minutes in taking his meal. Dr. Benj. Franklin who was, when young, a great bustler, and placed an exaggerated value on time, says a man should arise from the dinner table with a good appetite; a rule applicable to most cases, but not to all. I would not be thought as encouraging a needless waste of time in eating or in anything else, but that man must but poorly improve his hours of business or labor who cannot spare half an hour in which to take his every meal.

The common practice for adult persons in health is to take food three times each day—morning, noon and evening. This division of the periods of taking food is probably as good as any that can be suggested. But this stated period should be the *only* time of taking food. The pernicious practice of eating between meals, so

common to most people, is greatly to be deplored. It leads to overtaxing the digestive forces, and brings on eventually much suffering and derangement of health. All food, of whatever kind, should be taken at the regular periods of eating—even fruits, pastries and sweetmeats. . Any healthy stomach will contain and digest enough food to nourish the body if taken at the ordinary periods—beyond this, all is useless and productive of harm. It should ever be borne in mind that we eat and drink in order to live, because it is a law of our nature, not that we live to eat and drink.

Of the kind of food best for the nourishment of our human organism, we propose to treat in the present paper, not only that which will so far as it goes be most likely to preserve us in health, but that which will tend to develop the highest type of the physical man. The kind of food required by any particular animal is determined by the peculiar form of the masticating organs of the said animal. The carnivora, as the dog, cat, etc., have teeth suited only for eating flesh, and herbs and grains would be entirely unsuited to their nutrition. Other animals, as the ox and sheep have teeth fitted only for the proper mastication of grasses, herbs and other vegetable products. The rule we have given, that is, "that the proper food for any species of animal is determined by the form of its masticating organs," is of such universal application, and of such rare exception, that upon it has been based a department of natural science called Paleontology. To those skilled in this branch of science, it is only necessary to examine the teeth of an animal, and its food and many of its habits become apparent at once. The accuracy of the methods of this science is such that the fossil remains of many extinct species of animals are sufficient indicators of their habits and modes of life, and by this means much accurate knowledge of prehistoric animals and even of the condition of the earth in times when they existed, has been developed in our day.

Following this rule of the naturalist, we observe that man is designed to be nourished by various kinds of food. The peculiar construction of his teeth adapts him to eating flesh, vegetables, fruits, grains and farinaceous substances—he is in fact omniverous. That he is designed to live on various and in many cases dissimilar foods, that these are necessary to preserve his health, and to fully develop his physical being is a truism which the experience of ages has established. It is also observed that many peoples who have for ages lived on coarse and insufficient food have degenerated from generation to generation until perfect physical development is almost unknown among them. They become stinted in stature, coarse in feature, and lacking the intellectual force and physical activity which marks the character of more favored nations. That this is true of the lower classes of many European nations every day observation teaches us. We have seen something of this in our own country among people who call themselves "vegetarians." The writer has lived where he could carefully observe such persons, and truth compels him to say that he has never seen a firm, elas-

tic step, or a fresh healthy countenance among them. Pale, languid, apathetic, sickly looking creatures, were the rule.

Much has been said concerning the beneficial effect of exclusively vegetarian diet among students and those who must daily do severe mental labor. The idea is a most mistaken one, for if the brain labors assiduously it needs the same nourishment as other organs of the body when undergoing severe exercise. We have seen the result of the vegetarian system in the enfeebled health and ruined hopes of many promising students. If the student will take heed to the physical law of his nature—take the food nature designed him to have, and plenty of free exercise in the open air—he will find no use for a vegetarian diet. In the selection of proper food, each species of the brute creation is guided by the unerring instinct of its kind. We never hear of a dog eating grass or hay, or of a cow eating flesh. Perhaps the wants of their nature, or some peculiar sensation of hunger, is the guide by which they are directed. With man, however, food is the subject of experience, reason and scientific research.

In early infancy, before the teeth are developed, nature provides for us the simplest form of animal food in the milk of the mother. The principal nutritive qualities contained in milk are butter or fat, casein or cheesy matter and sugar. Human milk is not only more nutritious but more easy of digestion than cow's milk, because it contains, in proportion to the whole quantity, more butter and sugar and less casein. This latter principle is not a proximate principle but must undergo digestion before it is available for purposes of nutrition. In case of infants who are deprived of their natural nutriment, we should endeavor to provide something as nearly resembling human milk as possible. The following is perhaps the best that has yet been suggested. The milk of a fresh cow should be allowed to stand in a vessel as deep as broad, for about three or four hours when about one-third of the upper portion should be dipped off (not poured). Add to this when dipped off an equal quantity of warm water, and put in refined sugar until it becomes perceptible to the taste. This will most nearly resemble human milk and is consequently most fit for the food of the infant when in health. When the teeth are developed and the child has acquired the use of its locomotive organs and taken on the active habits of that period of life, a more varied and substantial aliment becomes necessary. To this new necessity of the human being, both the animal and vegetable kingdoms of nature become tributary. Many of the most important nutritive principles are in common contained in both animal and vegetable food, and although found in unlike forms and under different circumstances, differ from each other very slightly or not at all.

We have heretofore spoken of the evident design of the Creator that our human organism should be nourished and supported by a variety, of edible substances. This has been established by actual experiment which proves that no single article of diet can supply all the material for the regeneration of the physical man. The healthy appetite indicates, that a varied diet is necessary. This

fact is also exemplified in long sea voyages, and in the march of large armies into an enemy's country, when from necessity the requisite variety of food is not obtainable. Analytical chemistry fails to show why this change of aliment is necessary, or in what the deficiency in a single kind of diet consists, but it is a truth taught us by experience that when we have for a time been confined to a particular diet, it loses the power of nourishing our bodies, and a supply of other material is demanded. This fact is often shown when the diet consists largely of salted meats, though it is equally true when we are confined to the use of a single kind of fresh meat. After a long confinement to a restricted diet as regards variety, a supply of other material becomes necessary, otherwise the defective nutrition manifests itself in many forms of diseased action, principally in what is called "scurvy."

It is thus apparent that a proper quantity, or even quality, of food is not all that is required for healthy nutrition and development, but that our nature requires also a variety. Fresh vegetables and fruits should be used at proper times. This was frequently proven during the late war. Often in hospitals where the diet was of necessity wanting in variety, there was an almost universal craving for raw potatoes and onions, and the writer has seen the condition of the wounds changed for the better in a whole hospital when it became possible to supply the patients with a proper variety of food. It therefore becomes a question of great responsibility to those who have the task of providing subsistence for large bodies of men that the needed variety should not be overlooked.

The principle of variety in food has been found to apply also to the lower order of animals. Burdach tells us that rabbits will not bear a restricted diet. Three young rabbits from the same litter were experimented on. One, fed on potatoes alone, died on the thirteenth day, and one, fed on barley alone, died in the fourth week, while a third was fed on potatoes and barley alternately every other day for three weeks and afterwards by the same articles given together, and it grew and developed into a healthy, vigorous animal.

The quantity of food necessary for a human being is so variable that no rule can apply to all, and any effort in this direction must be regarded as a mere approximation. This depends on the habits of the individual, on his age and peculiar physical conformation. Men who perform great physical labor need more food than those who do not, and as a rule it has been observed that persons of a lean habit of body, eat more than those who are fleshy. In the early periods of life also more food is needed in proportion than in adult life because, besides supplying the natural waste of the body a certain amount is needed for its growth and development. Then in very cold climates a much larger amount of aliment is necessary to preserve health than in more temperate localities. Dr. Kane relates that during a winter of intense cold, which he with his men spent in the Artic regions, each man would consume eight eider ducks and from three to five pounds of rice per day, besides his ordinary sailor's ration. He further says that from his personal ob-

servation the daily ration of the Esquimau is from twelve to fifteen pounds of flesh, one third of which is fat. He once saw an Esquimau eat at a single meal ten pounds of walrus flesh and blubber. A Russian officer tells us that he once saw a man eat at a single meal a quantity of rice and butter that weighed twenty-eight pounds. The writer remembers a blacksmith whom he knew in early life, who was a huge feeder and whom he once heard remark that he had never yet taken sufficient food at a single meal to satisfy his appetite. This man was rather spare in flesh but had a fine development, a great capacity for labor and was endowed with extraordinary physical strength.

Perhaps the healthy appetite is the best guide to the quantity of food necessary for the sustenance of the individual, and under proper restraint and restricted by sound common sense, no better rule can be given. It is perhaps only necessary that human beings should avoid substances that are known to be destitute of nutritive principles, and which are sometimes eaten to gratify the promptings of a morbid longing for something. We will now pass in review some of the more important articles of food, and what are thought to be the best methods of preparing them for the purposes of nutrition.

At the head of this class stand the different kinds of meats, a name generally given to the flesh of the herb-eating mammalia. The flesh of this variety of animals, although not of all of them, is considered fit for food. The flesh of the horse, of rats, and many others is excluded from the table in civilized countries. Attempts which have found favor with some scientific men have been made to introduce the flesh of the horse into use and give it a place among the edible meats. Although horseflesh is probably still consumed under other names in spite of the prejudice against it, the experiment may be pronounced a failure. It seems to be insufficient to supply the necessities of our organism, and is, we believe, not now openly exhibited for sale in the provision markets of any civilized country. Also dogs, rats, cats, and mice have long been used in the large cities of China as food, yet even here they are mostly sold or prepared into mixed dishes under an assumed name.

Instinctively mankind generally prefer beef, and experience has taught that this article can be used more constantly than any other of its class. This is undoubtedly because it is composed of principles that taken together more completely supply the demands of our organism than any other meat. It is a notable fact that when used constantly, no articles of food so soon lose their relish as those which, when taken occasionally are considered as delicacies, such as venison or any variety of game. Most people can realize that it would be hardly possible to live on any variety of game for three months, and yet many persons live on beef for years and do not lose the appetite for it. For this and many other reasons it may be laid down as a rule that beef is the most digestible of all kinds of meat, and its influence on the nutrition of the body most favorable. It is perhaps unnecessary to say that the animal taken for beef should be of mature age, in good health and

and that the animal should be slaughtered some little time before the beef is used.

As beef is to be considered as the type of meat foods, we will here give a chemical analysis of it furnished by Berzelius:

Water	77 17
Muscular tissue	15.80
Tendinous tissue	1.91
Albumen	2.20
Substances soluble in water	1.05
Substances soluble in alcohol	1.80
Phosphate of lime	.08
	100.00

Next to beef as an agreeable and nutritive meat stands mutton. So far as its nutritive properties are concerned it would perhaps be difficult to say that it is inferior to beef, yet there are few persons who can take it for any length of time without acquiring a distaste for it, a fact that should teach us that it does not supply that variety of alimentary matter which we so imperatively demand.

Pork is most commonly used after it has been preserved by salting or smoking; but when used fresh, if thoroughly and properly cooked, it is a very agreeable and highly nutritious article of food. The taste will not tolerate fresh pork as long as it will cured hams, bacon, shoulders, etc. It should be borne in mind that pork sometimes contains the trichina spiralis, and when taken into the stomach deficiently cooked, these parasites sometimes find their way into the muscles and produce serious disease, and sometimes death. Pork so infested is said to be measly, and may be detected by its general appearance, or by microscopic examination, or by the peculiar crackling noise emitted during the process of roasting or broiling. As a matter of precaution, pork should never be used until it is very thoroughly cooked.

The flesh of many non-domesticated animals is, in our climate, used as food, as that of the bison, the different varieties of deer, the bear, the raccoon, the rabbit and the squirrel. The flesh of these animals is, in some instances, highly flavored and nutritious, but when constantly used for a time becomes distasteful, and finally, if persisted in, absolutely repulsive. In nutritive qualities all are much inferior to beef. The same may be said of the flesh of the bird family, whether domesticated or wild, as the fowl, turkey, goose, duck, swan, pigeon, quail, prairie-chicken, grouse, and many others. Poultry, as a rule, is palatable and easy of digestion, but the game birds are very decidedly flavored, and soon become distasteful if used as food too constantly.

We have heretofore spoken of the animal products, eggs, milk, butter and cheese, and the limits of this essay forbid further mention of the subject than to say that each plays an important part in the perfect nutrition. We remark, with regard to eggs, that when they are partially cooked they are much more digestible than when rendered solid by long boiling. With regard to milk, we re-

mark that the animal producing it should be fed, if possible, on fresh vegetable food adapted to its highest nutrition; should be kept in good flesh, and during winter should be kept in a clean stall and have plenty of exercise in the open air with water often given, and, if possible, either turnips, potatoes, carrots or rutabagas at least once every day.

Besides the meat foods already mentioned, the edible portions of many fishes, reptiles, mollusks and crustacea are used as food. The flesh of all fishes requires to be very thoroughly cooked, when it becomes tolerably nutrient and agreeable. Salted fish, however, are almost destitute of nutritive qualities, these principles having been almost entirely taken up by the salt in which they have been preserved. Of the reptile tribe the green turtle and salt water terrapin are largely used by the seaside restaurants in making soups. The flesh of the turtle, when cooked, bears a close resemblance to veal. Of the mollusks, the most used as food are the oyster and some varieties of clams. The best American oysters are large enough to be cooked in a variety of ways, and their flavor, when developed by cooking, is superior to that of any in the world. The crustacea are better known as shell-fish, and are mostly used as articles of luxury. They include lobsters, crabs and shrimps. As a rule, their flesh, though said to be nutritive, is very difficult of digestion.

In the preparation of most kinds of animal food, roasting and broiling are the simplest and most rational means, and are essentially the same in their operation. By these means the outside of the flesh becomes first hardened and prevents the escape of the juices and nutritive substances as well as the flavor during the further process of thorough cooking. Many meats are well prepared by boiling when the object is to cook thoroughly, and to extract as little of their juices as possible. In boiling, however, the meat should be put into cold water and heat applied afterward. Stewing is a process by which meats are made very tender, and the juices which are extracted are preserved in the gravy. Frying is universally disapproved as the worst possible way of preparing meat. The very high temperature to which meat is exposed by this process greatly impairs its nutritive properties. When meats are prepared in this way they should be covered by crumbs or batter, which, to some extent, prevent the injurious action of the process.

It is unnecessary to discuss the methods employed in preparing mollusks, crustacea etc., which are generally regarded as articles of luxury, and a consideration of condiments, spices etc., and various vegetable articles used in refined cooking would be out of place, as they refer chiefly to the taste and have no direct bearing on nutrition. Before however, leaving the subject of animal foods and their preparation, we will briefly refer to a very important physiological subject, with regard to the principles which are extracted from various meats by prolonged boiling and the best method of making a nutritious and economical soup. Soups are very largely consumed by all classes of community, and when

properly prepared are quite nutritive, so much so as to be a matter of wonder when we consider the small amount of solid matter which they contain; the proportion of solid matter not being more than nine or ten parts per thousand. In making soups, various vegetables are added, which beside flavoring them, supply a certain quantity of nutritive matter. As the type of all soups, we will give the manner of preparing the celebrated "*bouillon*" of French *cuisine*.

Take of water	20 gallons.
Take of meat with the bones	68 lbs. 10 oz.
Take of vegetables	13 lbs. 10 oz.
Take of salt	1 lb. 12¾ oz.
Take of burnt onions	7¾ oz.

The meat should be cut off from the bones and tied with strong cords in packages of nine or ten lbs. each, and the bones broken up and placed in the bottom of the kettle. The meat should then be placed upon a grating or perforated false bottom above the bones. Twenty gallons of water are then poured in, when the whole is raised to the boiling point and the scum removed as it forms. It is kept gently boiling for two hours, during which time it is constantly skimmed. Between the first and second hour when the skimming is nearly completed, the vegetables, with the burnt onions are put in, enclosed in a net bag. A gentle boiling is then maintained for four or five hours. The fire is then extinguished and after an hour, the vegetables, the meat, and the bouillon are taken out. When the latter is to be used, the congealed fat is to be taken from the top, and the bouillon mixed with an equal quantity of water to make soup.

It now remains to treat of the cereals particularly, and the kinds of aliment prepared from them, especially bread. The cereal grains proper for food of the human race are wheat, maize or Indian corn, rye, buckwheat, oats, barley and rice. Except rice and barley, these are generally ground into flour or meal, freed from the bran, and made into bread, cakes, gruel or porridge. These preparations are all more or less important as nutritive substances. But wheaten flour is the only preparation made from the cereals capable of making that most important of all alimentary articles—good bread. It is true that bread may be made from corn, rye and barley, and they are all more or less nutritive; but corn bread, which is largely used by the people of our Southern States, and is highly nutritive on account of the large proportion of oily matter which it contains, is apt to cause derangement of the stomach in persons not accustomed to its use, especially when not carefully prepared. In the large cities of the civilized world, corn is not a very important article of diet.

Rye is sometimes used in place of wheat because of its cheapness, and it makes tolerable bread, but it cannot take the place of wheat as an aliment. In composition, it differs from wheat in containing less nitrogenized matter and more dextrine and sugar. The composition of buckwheat is nearly the same as rye, but it contains less dextrine and sugar. Principally in this country, it is

used in making baked cakes, which are highly esteemed by many. In some of the poorer sections of the old world the flour is mixed with wheat flour in making bread, but only on account of its cheapness, as it does not improve the flavor of the bread, and, as a nutritive article is very much inferior. Oats contain a large portion of oily matter, and are largely used as an aliment in Scotland, and in the northern counties of England. The oatmeal cakes so common in Scotland almost invariably produce derangements of digestion in persons not used to them. It has been also remarked that acidity of the stomach and what is called "water-brash," is more common among the lower classes in Scotland than in any other part of the world. Barley is not an important article of diet. It is sometimes dried by a peculiar process and sold in the markets as an aliment under the name of "pearled barley." It is not very nutritious, but, used therapeutically, affords an agreeable demulcent drink called barley water. It is also sometimes made into puddings, and used at meals as a desert.

Rice is noted among the cereals for containig a very large proportion of starch, reaching nearly to ninety per cent. Millions of people in Eastern countries are said to subsist almost solely upon it. Where it constitutes so large a proportion of the daily food, it is consumed in enormous quantities. Its influence upon the people who are dependent solely upon it for food, is remarkable, for they lack the robust, healthy, physical development common to nations who use a mixed diet. In civilized countries, it is not a very important article of diet.

We come now to the further consideration of that most important of all articles of food, either animal or vegetable, appropriately denominated the "staff of life," because it presents such an admirable combination of all alimentary principles as causes it to be accepted as the prime article of diet in all civilized countries. It rarely becomes distasteful from monotony if properly mixed with other kinds of food, and this alone demonstrates how completely it meets the demands of the human system. There are few questions connected with alimentation of greater importance than the making of *good wheat bread.* In bread-making we may safely adopt the French method which is said to furnish the best bread in the world. Most assuredly the first step toward making good bread, is to have good flour. The best flour is said to be obtained from the hard grains, and in the production of this class of cereals, this country is not surpassed. The first step in bread-making is to mix one hundred parts of flour with fifty to sixty, by weight, of water and add to every ten pounds of the mixture half an ounce of fresh yeast, with a little salt; some bakers add a little potato or alum but, although not injurious, these latter substances must be regarded as adulterations. The mass is then kneeded until it forms a homogeneous dough when it becomes so tenacious and elastic that the surface will not be broken by the gas, to be generated in the interior. Then dividing it into loaves it is set aside from six to eight hours in a temperature of 80° to 100° Fahrenheit, to "rise." Some chemical changes take place during the rising of the bread, which have

been called "panification" in which process some of the natural alimentary substances are transformed into compounds, and gases are eliminated, and in this way the dough is raised by the formation of little cavities in it, and given its porous character which becomes fixed in the process of baking. When the dough is sufficiently raised it is put into the oven and baked. Heat at first increases the development of gas, but when the temperature reaches 212° Fahr., the process of fermentation is arrested and the process of baking being continued the dough is fixed in its expanded condition, the alcohol generated during fermentation being driven off by the heat. The outside parts of the loaf are exposed to a temperature of about 375° and become hardened, forming the crust which contains more soluble matter than the interior. The inside of the loaf does not acquire a temperature much above 212°. Acidulous fermentation takes place to a limited extent even in fine white bread, but must not be allowed to proceed too far, otherwise the bread will become sour and indigestible. Bread should not be eaten warm but allowed to become "stale," as then it is more easily digested. Various kinds of brown bread are made from grains differently prepared, but as an article of diet they are all inferior to good *wheat bread.* Notwithstanding the great value of bread as an article of diet, and admirably adapted as it is to the wants of the physical man, it is doubtful if he can, for any length of time, subsist on that alone. It comes to us on the authority of a young English physician that Dr. B. Franklin, when a journeyman printer, had lived for two weeks on bread and water alone, that he consumed ten pounds of bread per week and found himself at the end of that time well nourished and in good health. This same young Englishman himself fell a victim to ill-judged experiments on his own person of the effects of different kinds of food. He lived forty-four days on bread and water, twenty-nine days on bread, sugar and water, and twenty-four days on bread, water and olive oil, when his constitution gave way and he died from the effects of his own experiments. The impossibility of sustaining the human frame on bread alone has so far been recognized in Christian lands that the old punishment of confinement on bread and water is fast becoming expunged from the criminal laws of the civilized world.

Certain leguminous roots are largely consumed as food, and of these the common potato is by far the most important. It forms a larger part of our food than any other vegetable product except wheat, and of all vegetables, is the one that becomes least distasteful from continued use. It forms a very large part of the food of the poorer classes in Ireland and Germany; but those who are too closely confined to it are not well nourished. The best method of preparing the potato is by boiling or baking, when its substance becomes softened by the disintegration of the starch granules which it so largely contains. Important as it is as an article of food, the study of its qualities shows that it cannot maintain our organism in full vigor, as it is deficient in many principles which our nutrition imperatively demands. The sweet potato and beet root are also largely used as food and supply many wants of the body. Also

parsnips, salsify, carrots, onions, and garlics supply us with vegetables more or less nutritious. These articles are craved when the system is suffering from a deficiency of vegetable food. Many green leaves and leaf-stalks, as cabbage, cauliflower, lettuce, celery, chiccory, cresses, etc., are not used as food but chiefly as articles of luxury. *Sauer-Kraut* so largely used in Germany, is made by packing cabbage with salt under heavy pressure and allowing it to stand until acetous fermentation takes place, when it is stewed and eaten with meats. Of the edible leguminous seeds, beans, and peas are most important. When dried they constitute an important part of army rations. Though inferior to the cereals they are considered highly nutritious, for they contain a large amount of nutritive principles.

Ripe fruits are largely eaten as articles of luxury and contribute to the variety of food, but they are not very important as alimentary substances. The various melons are very grateful and refreshing, but they contain a very small amount of nutritive matter.

The refinements of modern cookery require a large number of articles, which cannot be considered as alimentary substances. Pepper, capsicum, vinegar, mustard, spices, and articles of this class have no decided influence on nutrition except as they promote the secretion of the digestive fluids. Common salt has indeed been said to be a nutritive principle, for it is known that no animal can be well nourished without it, and it exists naturally in many edible meats and vegetables.

OF DOMESTIC BEVERAGES.

Under this head we will consider coffee, tea, and chocolate. Water, which may be considered a principle of nutrition, is taken into the system not only as a drink but exists largely as a constant constituent part of every alimentary substance, at least when prepared as food. Pure water does not exist in nature. Even rain water contains certaiu substances in solution. The Croton water supplied to the city of New York, contains 4.16 grains of solid matters to the gallon.

Coffee is an article daily consumed by many millions of people in all parts of the world. In armies, it enables men on scanty rations to perform an amount of labor that would be impossible under other circumstances. After exhausting efforts of any kind, no food or drink relieves the overpowering sense of fatigue so completely as coffee. If my reader has been an army surgeon he will remember some instance where men were marched until when halted they laid themselves down in the mud or on the frozen ground until coffee was made, when every man received his pint, drank it, and perhaps marched ten miles further. At night, after severe duty, the first desire of the soldier is for coffee, hot or cold, with or without sugar, the only essential being a sufficient quantity and a pure article. Except in persons who, from some constitutional peculiarity are unpleasantly affected by it, the importance of coffee as an aliment or as a substitute for scarcity of food is

REGISTRATION.

The Necessity and Advantages of a Registration of the Vital Statistics of Wisconsin.

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REGISTRATION.

This paper, intended for the general reader, has for its object—to show the necessity and advantages of a registration of the vital statistics of Wisconsin; what we are doing to obtain such a system; what ought to be done to make it operative, and who are to do the work.

If it be true, as Locke says, that "the end of government is the good of mankind," then, the protection of the health and life of its people is the first duty of a government.

In order, however, to effectually legislate for the protection and preservation of the public health, the well being and longevity of its subjects, the government of necessity must know not only by figures, the birth and death rate of the governed, but the agencies which conduce to the production of those figures. Hence the necessity for the adoption of a system of registration, a system in operation in every other civilized nation, and in many of the more intelligent States of this country.

It may be well to premise that this practice of registration is not a thing of to-day, that it has nothing in its character that is either novel or theoretical. It has existed, with the greatest practical benefit, in Geneva, Switzerland, since 1549. It was introduced into New England as early as 1639, an act being passed in Massachusetts, ordering "that the days of every marriage, birth, and death of every person within the jurisdiction" of that State should be recorded.

The health of its subjects and the average duration of their lives is to every government a matter of the highest consideration. And to be indifferent to, or ignorant of the laws which affect human existence, would be to make the legislator responsible for the ravages of every preventable epidemic invasion. But how shall the legislator or government of our State be able to act intelligently or effectually in relation to public health? In no other way, we reiterate, is it possible than by an adequate knowledge of our vital statistics, to be derived through registration, by which not only are the causes of disease and death ascertained, but the proportion of the death-rate to the population, and to the occupation of those who died—knowledge of no secondary importance.

In no other way than by carrying out this system of registry can we fully know—that which concerns us so much to know—what parts of our State are best adapted to health, or most provocative of disease, or the parts best calculated to ameliorate certain classes of disease. We do know that some places and circumstances are more fatal to children, some to adults, and some to the aged, than others. In one locality one class of disease, and in a different one another class prevail. So much is known of all the States, but

even with the aid of the sanitary maps of the United States census, or those of Walker's Atlas, nor, indeed, with the aid of the vital statistics there given can we derive any positive information on these points applicable to this State, anything that is not of an exceptional character. "Local influences differ much in different places and seasons. But what those influences are, or wherein they differ, we are not informed. We only know it by partial investigation and vague report. We have not sufficient data for definite plans of action," says one of the ablest writers on this subject.

It is these data that we need. For it is data of this description which tell us in the most indisputable manner where we may locate to live, and again, where may locate to die. The value, the necessity of this knowledge is easily illustrated. We learn from English registration that "while a child has a chance of living 45 years in Surry, it has a chance of living only 25 in Liverpool." In a registration report of Massachusetts we find that "in the county of Suffolk the average of life is 20 years. In the county of Hampshire it is 40 years—so also in Duke county, 40 years." The round numbers only are given, discarding fractions. Do not facts like these, facts officially given, ascertained only by registration, conclusively show the necessity for a system of registry and at the same time answer the question—What is the good of registration?

If, as before indicated, you want to move into a State, or any part of a State in safety to your health, or for the purpose of seeking relief from disease, or from some peculiar physical condition, it is just this system of registry with its life line that would and should govern you in your choice of locality. If this life line showed to you that the average of life was only, as officially reported some years ago, 27 years in Boston, Massachusetts; only 34 years for the whole population of Massachusetts; 27 years for London, and only 20 years for Liverpool, England; while it was 40 years in Geneva, Switzerland, and 41 years for the people of Plymouth, Massachusetts, and doubtless over 40 years for this State of Wisconsin, then indeed should you be converted to a belief in the necessity for and advantages of statistical information and in our system of State registration.

For other reasons yet is the carrying out of our law of registry necessary. We quote from the report of the Commissioner of Insurance of Wisconsin, June 1, 1876: "The total number of life policies issued in the State during the year 1875, was 3,179; amount insured, $4,530,752; amount of premiums paid, $1,340,766. The number of life policies in force at the close of the year was 23,343; amount insured, $35,479,291. The foregoing exhibit does not include the policies issued by the Railway Passengers' Assurance Company and the Hartford Accident Insurance Company."

The people of Wisconsin, then, are directly interested in life insurance to the enormous amount of $35,479,291!!! *Upon what basis do they invest their money?* Upon the American table of mortality, of which Prof. C. F. McCay, of Baltimore, says in the report of the National Insurance Convention of October, 1871:

"The world is in profound ignorance as to every element on which the table was based, and how it was constructed." Mr. Clarke, of Massachusetts, saying in the same report, "We *want* a table of mortality which will be acceptable to the companies in all the States." And the report of a like convention for May, 1871, has this language: "The mortality experience of different companies varies now from various circumstances, and will continue to do so in the future, rendering it necessary to collect data from many institutions and sources, and also such as will cover a sufficient period of time before an accurate table of mortality can be constituted."

The American table, as its compiler, Mr. Homans, says, "was constructed in 1859 *from the experience of one company*, the Mutual Life." But highly commended as it is by foreign and home actuaries and companies, no one accepts it as being correct, and undoubtedly, even proximately, it is most incorrect, applying probably very much better to eastern States and to like populous and manufacturing countries than to western or agricultural States.

And herein lies the point. How far is a mortuary table that is applicable to England and to the eastern States for life insurance purposes applicable to Wisconsin? Now, casting aside for the moment all data with regard to this point, for all the data are comparatively worthless, (the United States census itself admitting that there must be 41 per cent. more mortality than the assistant marshals report) let us fall back upon the experience and knowledge at our command.

Having practised as a physician a sufficient length of time in England, in Massachusetts and in Wisconsin, to enable us to judge if not accurately, at least fairly, of their comparative mortality, we feel, that from the recent and excellent origin of our people, being composed as they are of the bone and sinew of Europe and of the East, of the most adventurous, hence physically calculated to live; from their occupation, being chiefly that of agriculture;* from the cheapness and abundance of good food; from the general good habits consequent upon the general striving for a home, a farm and independence; from our latitude; from our elevation; from our easy drainage, east, west, north and south; from our soil; from the marked salubrity of our climate; from our comparative freedom from malarial diseases; from the strikingly and peculiar mild type of all our epidemics, mild, especially as compared with that of England or Massachusetts;*and last, though not least, from raising—through our common school education—an intelligent generation; we repeat, that from a due consideration of each and all of these life elements, we feel that we can earnestly affirm that the average of human life in Wisconsin is much greater than in England, or in the Eastern States. Consequently we should be benefited in this one item of insurance to the extent of a saving probably of 25 per cent. on our premiums, in having a mortuary table of our own.

* In Dorchester, Massachusetts, the poor average 27 years, and the prosperous farmers 45 years of life. The same rate applies to England.

* The severity of epidemics is governed by the insalubrity of the locality, or is "according to a compliance with, or disobedience of the principles of health."

If this be so, and while there are data to justify such a conclusion,* there are no facts to prove that it is not so, then surely another and a good reason is given for the better observance of the registration law.

The sooner we can ascertain the average of life, then, in this State, the sooner will our people save from 20 to 25 per cent., or a great deal more than a quarter of a million of dollars a year in their life insurance payments.

There are still other reasons which make it necessary for us to have a mortuary table of our own for the purposes of insurance. *Our rate of insurance should be adjusted to our rate of mortality.* As the rate of mortality changes in different States, at different times and from local influences; so it is impossible that the insurance rate of one State can be even proximately correctly applied to another. And it might be said, though perhaps not with equal force, that the insurance rate of one period is inapplicable to another. Mr. Homans. a gentleman of high authority in such matters, well says: "If a table constructed twenty-five or fifty years ago was a true representation of the mortality of that time, there is no certainty that it will be for the future. Our type of mortality is changing. The mode of life is different from what it was a quarter of a century ago."

And further, "the effect of the war and its incidents upon the nervous system, it is claimed, has been enormous. In the great centers of population data have been collected to show that the mortality arising from nervous diseases during the last decade has increased more than twofold and in some more than fourfold." As this information comes through the National Insurance Convention of May, 1871, it is deserving of consideration.

If we accept these two statements, we are forced to see in them the premised necessity for our system of State registry. Admitting, however, that the mortality from nervous diseases in our population, having but one comparatively populous centre—may have been in some measure affected by the same influences, still, it must have been but to a fractional extent—and therefore we should be exempted from those rates of insurance properly enough calculated for large centres of population, or for those States more affected because more implicated in the war.

It were easy to add fact after fact and argument after argument *ad infinitum,* to show the necessity of properly carrying out the law of registry as committed to the State Board of Health by the legislature of last winter. Another word however ought to be sufficient. An eminent english jurist has well observed to the British Parliament "that it appeared to him fully as necessary for the preservation of the rights of individuals to preserve a register of births, deaths, and marriages as it is to preserve a register of deeds."

*Taking the extreme cases, we find the farmer and the shoemaker in Massachusetts, at the age of 20, with the prospect of living 43.53 years extended to the former, while that of the latter is curtailed to only 23.04 years, showing a difference of nearly one hundred per cent. Laying aside all considerations more elevated than those of merely a pecuniary element, and we find the farmer paying the same premium for life and health assurance as those of other callings in life, although the latter may have no chance of living much more than one half as long as the former;—Eighth Registration Report of Mass.

In attempting to show the necessity of a system of State registration, as will have been observed, some of its advantages have already incidentally appeared. Other advantages, however, as great as they are numerous, may be adduced. To point out a few of these will be to indicate the character of the many. It serves "to preserve the name, and afford the means of identifying the connexions, and save facts concerning the personal history of every person who is born, marries, or dies, in the community. It facilitates the legal distribution of property, shows the influence of civilization, occupation, locality and other physical and social agencies."

To the physician it is of paramount importance. "Diseases are more easily prevented than cured and the first step to their prevention is the discovery of their exciting causes." In this relation it must not be overlooked by the public, nor ignored by the profession, that medicine is but a progressive science. There is much in it yet to be learned, many vitally important points to be determined, not a few of which can only be determined by an accurate system of registration.

A registry of deaths shows with the most fatal accuracy the localities and sources of pestilence. It will show us here, as medical history has shown in England, that the haunt of one pestilence is ever the haunt of another pestilence, from one generation to another. Where the plagues of the middle ages made a charnel house, in just those same places pestilences of all kinds, cholera, diptheria, typhoid, small-pox, measles, scarlet fever, etc., find either an abiding home, a common centre, or a starting point to-day. The black spot on the sanitary map of those times is still the black or blackest spot on the sanitary map of yesterday. Just as every wild beast of the woods has its lair, so, too, has every pestilential disease that preys upon humanity. And it is just here that we should attack our enemy.

Registration teaches us every day that which every day should be brought to our knowledge, that we may and do in a large measure weave the web of our own life. That death being for the most part the result of influences by which we are surrounded, we have it greatly in our own power to make those influences conducive to life, or to our destruction. Our habits either make or mar us. Our eating; our drinking; our clothing; our personal cleanliness; our schoolrooms, our church buildings, and even our legislative halls; the air and situation of our houses; our houses in their construction, material arrangement for heating, lighting and ventilation—their very newness; our occupation; our education, etc.; all alike have an influence for good or for evil, and all alike come strictly within the province, within the legitimate consideration of the vital statistician.

Let us examine. In looking over a table of classified causes of death, we find the largest proportion of deaths (3,186 out of 10,000) to be owing to diseases of the breathing organs, naturally enough suggesting the question, how many of these deaths are attributable to a neglect of proper clothing or proper homes? The next largest proportion (2,736) comes from what are called zimotic, in

other words, preventable or removable diseases, diseases which *you* have it in your power to prevent.* Another proportion of 748 occurs from diseases of the digestive organs, and still another of 942 from nervous diseases.

Looking at these figures, almost too suggestive for comment, is it too much to affirm that death is for the most part the result of the influences by which we are surrounded? or that we have it within our own power to live or to die? It is by records such as this table presents to us, the result of registration, that vital statistics teach us, how to live as well physically as mentally, and even morally. For it is admitted by all nations that, as there is an intimate relationship between health and morality, so there is also just the same relationship between health and crime.

Considered materially, were we inclined to appeal to the love of lucre so natural to us all a mortality table of this State would undoubtedly be an early and a most effective instrument to use. By comparison of her health and life line with that of England and the Eastern States, Wisconsin must be an immense gainer. A gainer by a greater influx of people, by the increased value of her lands, the development of her agricultural, mineral, marine and manufacturing resources. And consequently, of her material wealth.

The more one examines the subject of vital statistics the more truths—useful and profitable for us to know—are found to multiply themselves. It were indeed vain to look for any limit in the advantages to be derived by mankind from a sound and operative system of life and death registration.

To obtain this much desired system of registration, many efforts have from time to time been made in this State, but not until last winter were these efforts successful, when the organization of a State Board of Health and of Vital Statistics, was effected. All our aspirations and labors now, are directed to making the law operative, to bring it to the knowledge and into the favor of the people, to make it work for the good of the State and of the country. To do this, the board and the Secretary of State are issuing circulars of instruction and letters of enquiry, and are using their best and most active endeavors.

The law itself, as compared with those of other States and countries, will be found, in spite of some defects, such as to commend itself to general approval. Did it not occupy too much space we should be glad to quote it at length.

What it proposes to enforce and what under fines and penalties it must and will of necessity enforce, is, a thorough and correct report of our births, deaths and marriages. The necessity for this enforcement is made obvious enough by a single glance at the report

* The justly celebrated Dr. Rush has said: "To all natural evil the Author of Nature has kindly prepared an antidote. Pestilential fevers furnish no exception of this remark. The means of preventing them are as much under the power of human reason and industry as the means of preventing the evils of lightning and common fire. I am so satisfied of the truth of this opinion that I look for the time when our courts of law shall punish cities and villages for permitting any of the sources of malignant fevers to exist within its jurisdiction." And the General Board of Health in England say: "The British Parliament has legislated on the conclusion, submitted with an accumulation of demonstrable evidence, that the causes of epidemic, endemic and contagious diseases are removable."

of the Secretary of State for 1875. At page 188 we find that while the population of Dane county, the capitol county, is 52,798, and the number of marriages 378, there is neither a single death or birth in the county of Dane. Wonderful people of Dane! where no one is born and nobody dies. And as with Dane, so with Dodge, with its population of 48,394; just the same with Crawford, Kenosha, and other populous counties. In brief, of 60 counties in this State, from only 15 of them are any births and from but 13 are any deaths returned.

With such an exhibit it would seem that from some dreaded cause there was an almost general desire to conceal from ourselves, from other States, and from the people of Europe, the status of our public health. With an intelligent people, such as ours is known to be, no one outside of the State would or could attribute an official report of such a character to indifference on our part, nor could anyone inside of the State attribute it to the want of due diligence on the part of the State Secretary.

It should not, however, be forgotten, while discussing what is being done to obtain registration, what has been in part already stated, that our Legislature of last winter organized the State Board of Health without a dissenting voice in the assembly and with not a word of opposition in the senate. The leaders on both sides, of both parties of the Legislature were in favor of it, as was also the Executive and the State Medical Society, at whose instance the bill was introduced.

What ought to be done, and who are to do the work, to make the law of registration operative?

Its defects (if any) should be removed at the earliest possible moment.

That the death returns may be made intelligently, and subserve to the purposes for which they are required, we should have at once an official nomenclature of diseases.

As to those who, independent of the paid registrars, are to do the work: they comprise not only the State Board of Health, but every government official in the State, from the Executive downward. From our profession, specially, is it required, and only a little less so from the clerical and legal professions, as well as from every patriot, and from every man of intelligence among us.

It is a work of humanity, and therefore concerns every man. It is a work of aggrandizement for the country, and therefore directly concerns every citizen. It is a work replete with truths and matter of the highest, and most useful, and interesting character, and therefore concerns every one of intelligence, or of scientific or literary culture. It is a work without which disease and death, and ignorance and crime, and poverty and depopulation run riot, and therefore it is a work that concerns us all.

In conclusion let me remark, what a very old experience in sanitary law suggests—that we must each of us have patience with the other in carrying out this system of registration. Our legislature will not overlook the fact that though the commonwealth of Massachusetts instituted this system some 237 years ago, it is to-

day far from being perfect in its character, as is admitted in its last report. And even so in England, where its present system was instituted in 1537. Grand and good to society as its results have been, the work according to a communication received the other day from Mr. Chadwick, is still, by the "Sanitary conference convened by the British Medical and Social Science Association, May 12, 1876," considered "confused and unsatisfactory." Nor with these admissions before them, will the profession or the people of this State be disappointed if it takes, as take it must, many years to develop our own system successfully, or to its desired extent. That we have at last began in earnest, and in the right manner, is to have accomplished much. All that is wanting, is a continuance of the same faithful earnestness on the part of the legislature, the profession and the people, and the end come when it may will crown the beginning.

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SECOND

ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF WISCONSIN.

FOR THE

N.Y. ACADEMY OF MEDICINE LIBRARY

YEAR ENDING DECEMBER 31, 1877.

MADISON, WIS.:
DAVID ATWOOD, PRINTER AND STEREOTYPER.
1878.

PRESENTED TO

The New York Academy of Medicine.

By the State Board of Health

Of Wisconsin Sept 6. 1879

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GENERAL REPORT OF THE BOARD.

STATE OF WISCONSIN,
Office of the State Board of Health,
JANUARY 10th, 1878.

To the Honorable, the Legislature of the State of Wisconsin:

The State Board of Health herewith presents to you its second annual report, as required by the law under which it was organized.

For a detailed account of its operations, we refer you to the accompanying report of the secretary.

In presenting this report, the undersigned beg leave to reiterate their sense of the importance of the work entrusted to them and to express their conviction of its growing usefulness. It is difficult to overestimate the value of sanitary labor, even if it be viewed from a material standpoint only. The fact is but beginning to be fairly understood that human life has a distinct money value, and that no community without health can be either prosperous or wealthy. The history of every epidemic helps to teach this lesson. Preventable diseases are annually costing the people vast sums of money. The epidemics of small pox, of scarlet fever and of diphtheria, which have prevailed in our own state during the last two years, are examples of this class. A large proportion of these diseases, including the whole of small pox, to which within the last eighteen months nearly 500 of our citizens have fallen victims, might have been prevented by a knowledge of, and obedience to, the laws of health.

A large part of the labor of this board has been expended in the effort to instruct the people in the prevention of disease. As one of the means of accomplishing this, the members of the board have prepared, in the interests of the public health, a series of articles, with the view of placing before the people such information as will

help them to a knowledge of the means by which disease may be averted and life prolonged.

The following brief reference to these articles will explain their nature.

SCARLET FEVER — ITS NATURE AND MEANS OF PREVENTION,

is the subject of a paper by Dr. Griffin. The prevalence of this disease as an epidemic in many places in the state during the past year, and at the present time, makes the paper a timely one. It is fully demonstrated in this article that multitudes of young lives annually fall needless victims to this disease. Regarded as the most constant epidemic afflicting the community, and as "one of the most fatal of the diseases of childhood," its presence is everywhere a source of the greatest dread and anxiety. A careful observance of the rules given in this paper for preventing the spread of scarlet fever, will contribute materially to the relief of this anxiety, to the limitation of epidemics, and to the saving of life.

SMALL POX.

Dr. Griffin has also a brief article on small pox, supplementing the paper published in the report of 1876, by the same writer, which exhibits some facts concerning the prevalence and spread of the disease in this state, which should attract attention and lead to such decided action as will remove the disgrace of this continued evil from our commonwealth.

HYDROPHOBIA,

the subject of a paper by Dr. Marks, is a disease concerning which a large portion of the public entertain the most crude and unfounded opinions, leading in many cases to needless alarm and anxiety on the one hand, and to a false feeling of security on the other. The statistics here given show that hydrophobia is not a disease peculiar to or most prevalent in hot weather, but that temperature seems to have no influence upon its prevalence. The collection of facts concerning it, here presented, will, it is hoped, assist in forming more correct ideas of the disease, and give to the people, in this condensed form, information concerning it not otherwise accessible.

THE VENTILATION AND THE SANITARY DEFECTS OF OUR PUBLIC BUILDINGS.

The continuation of the labors of General Bintliff on this subject is this year presented, not only in the way of a generally instructive essay on ventilation, but enters into the particular examination of some of our public institutions. This subject opens one of the most practical fields of usefulness which the Board can enter upon. The most of our homes, as well as our public buildings, including Churches, Halls and School Houses, are constructed, apparently, without the slightest reference to the necessity of the inmates for an adequate supply of pure air. The problem of the proper construction and means of ventilation of our private dwellings is one very little understood, and the result of experiments conducted upon the more extended scale possible in our public institutions is one in which the healthfulness of the people is to a great extent involved.

If the plans of all public buildings, churches, halls and school houses were submitted to the supervision of some competent central authority, very much might be done to remedy some of the greatest defects which are now so frequently found and which involve the healthfulness of ourselves and of our children.

WATER AND THE WATER SUPPLY OF THE STATE,

is the subject of a paper by Dr. Witter, and also of a supplementary paper by Prof. Thos. W. Chittenden. The exceeding importance of this subject to the people of this state is such as will be obvious to all. Dr. Witter's paper is accompanied by much valuable information derived from the replies of numerous correspondents concerning the character of the water supply of their respective localities. The impurity of potable water is a fruitful and often wholly unsuspected cause of disease, the analysis of water supposed to be of exceptional purity, not unfrequently demonstrating its poisonous character.

DISINFECTANTS AND THEIR SPECIAL APPLICATION.

A paper with the above title, presented by Dr. Griffin, gives in a brief and practical way information of much value. The greater part of this paper is professedly compiled from numercus scattered sources, not readily accessible either to the people or to the physi-

cian, to whom its presentation in this compact and convenient form will prove of real service.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

A brief abstract of the proceedings of the fifth annual session of this body is presented by the secretary, as illustrating the great variety and importance of the subjects commanding the attention of Sanitarians.

VILLAGE SANITARY WORK,

is the title of a paper by Dr. Strong, showing the influence of the various causes of blood poisoning, which originate in the organic waste or filth of ordinary households, especially when aggregated in villages or towns, and describing the most practical methods of disposing of such waste so as to avoid this danger.

CORRESPONDENCE.

Under the head of "extracts from the communications of correspondents," there will be found information of much interest concerning the health of various localities, and many valuable sanitary suggestions.

VALUE OF VITAL STATISTICS.

Under this title, the board has been favored with an able article from the pen of Prof. J. E. Davies, M. D., of the State University, in which is shown the necessity for collecting these statistics on a large scale, and for extended periods of time, and showing that the results of such labors exhibit a remarkable degree of uniformity, and tend to the establishment of great laws.

In conclusion, the board begs leave to refer again to the fact that the main object to be accomplished by the publication of its annual reports is the dissemination of sanitary knowledge among the people. It is desirable therefore, that these reports be more widely distributed than is possible under existing laws, and it is hoped that such provision will be made as will place a larger number of copies at its disposal.

Very respectfully,

E. L. GRIFFIN,
JOHN FAVILL,
SOLON MARKS,
JAMES BINTLIFF,
J. T. REEVE,
H. P. STRONG,
G. F. WITTER,
State Board of Health.

SECRETARY'S REPORT.

STATE BOARD OF HEALTH,
Office of the Secretary,
APPLETON, Wis., December 31, 1877.

To the Board of Health and Vital Statistics of the State of Wisconsin:

GENTLEMEN: — I have the honor to present my Second Annual Report as Secretary and executive officer of this Board, for the year ending December 31, 1877.

On the 31st day of January last, the term of office of Dr. O. G. Selden, as a member of this Board, having expired, Dr. G. F. Witter, of Grand Rapids, was appointed to fill the vacancy. The present constitution of the Board is, therefore, as follows:

H. P. Strong, M. D., of Beloit..... Term expires January 31, 1878.
J. T. Reeve, M. D., of Appleton..... Term expires January 31, 1879.
Gen. James Bintliff, of Janesville.. Term expires January 31, 1880.
Solon Marks, M. D., of Milwaukee.. Term expires January 31, 1881.
John Favill, M. D., of Madison..... Term expires January 31, 1882.
E. L. Griffin, M. D., of Fond du Lac Term expires January 31, 1883.
G. F. Witter, M. D., of Grand Rapids. Term expires January 31, 1884.

The regular and called meetings of the Board during the year have been six in number, to wit:

At Madison, January 24–5–6.
At Madison, May 8–9–10.
At Milwaukee, June 7.
At Fond du Lac, July 23.
At Milwaukee, October 24–5.
At Milwaukee, December 19.

Several additional conferences of two, three or four members of the Board have also been held for consultation, or for business not requiring a formal meeting.

A very brief outline of these meetings will herewith be presented, giving only the result of prolonged discussions upon the work in which the board is engaged, so far as these assumed the form of resolutions adopted.

At the annual meeting which was held at Madison in January, the entire board being present, Dr. E. L. Griffin was reëlected President for the ensuing year, and the committees on finance, on legislation, and on printing and stationery were reappointed as follows:

On Finance — Drs. Selden, Favill and Marks.

On Legislation — General Bintliff, and Drs. Favill and Strong.

On Printing and Stationery — Drs. Reeve, Favill and Griffin.

In accordance with the rules adopted at the organization of the board, the duty of investigating and reporting upon specific topics was assigned to the several members, which, as modified at the second meeting of the board by the change in its membership, and for other reasons, is as follows:

On the Water Supply of the State in its Relations to the Health of the People — Dr. G. F. Witter; this being a continuation of the subject assigned to his predecessor.

On the Construction and Ventilation of Public Buildings and Private Dwelling-Houses — General Bintliff; this being a continuation of the subject of last year.

On Typhoid Fever — Dr. Strong.

On Criminal Abortion — Dr. Favill.

On Hydrophobia — Dr. Marks.

On Scarlet Fever — Dr. Griffin.

Some special lines of labor were also agreed upon, as explained by the following resolution, to wit:

Resolved, That a committee of three members of the board be appointed by the President to report upon the extent to which hygienic studies are pursued in our public schools, and to make such suggestions as in their judgment are needed on the use of text-books in the same.

The President appointed Drs. Favill, Strong and Marks as such committee.

It was also

Resolved, That a committee of three be appointed to visit the public institutions and buildings of the state, and to report upon the sanitary condition of the same, with suggestions of such changes as may be deemed necessary to promote their healthfulness.

The president appointed as this committee, Gen. Bintliff, and Drs. Reeve and Selden.

Drs. Griffin, Reeve and Selden were appointed as a special committee to revise the registration law, and report on what amendments, if any, are desirable to be make thereto.

These several committees having each made partial reports at subsequent meetings of the board, to which reference will hereafter be made, are still continued, Dr. Witter taking the place made vacant by the retirement of Dr. Selden.

At the May meeting, at which were present Gen. Bintliff, and Drs. Griffin, Favill, Marks, Reeve and Witter, the board officially visited and inspected the premises of a family then suffering from a virulent and fatal form of typhoid fever, which, in the opinion of the board, was undoubtedly caused by the poisoning of the water supply of the affected family through the percolation into the well of the contents of adjacent privies.

At this meeting, also, addititional plans of labor for the year were agreed upon, including the issue of circulars calling for reports from clerks of local boards of health, and health physicians.

At the October meeting of the board, the following papers were read, discussed, and approved for publication in the second annual report of the board, to wit:

"On Scarlet Fever"—Its Nature and Means of Prevention—By Dr. Griffin.

"On Hydrophobia"—By Dr. Marks.

"On Disinfectants and their Special Applications"—By Dr. Griffiin.

"A paper on the Water Supply of the State"—prepared by Prof. T. W. Chittenden, of Grand Rapids.

"A Report of the Proceedings of the Fifth Annual Meeting of the American Public Health Association"—By the Secretary.

"A general Report on the Ventilation of Public Buildings, and a special Report of the Sanitary Inspection of some of the Public Institutions of the State"—By Gen. Bintliff.

"A paper on the Value of Vital Statistics"—Prepared by Prof. J. E. Davies, M. D., of the State University.

At this meeting there was laid before the board copies of correspondence between this office and Dr. W. A. Gott, of Viroqua, concerning the unsanitary condition of the Vernon county jail. This correspondence was opened in September last, upon the receipt of an intimation of the unhealthy condition of the jail, received from the secretary of the State Board of Charities and Reform. It being at that time impossible for the committee on inspection of public buildings, personally to visit this jail, Dr. Gott was requested to act as a representative of the board, and to report to us its sanitary condition, and the exact method of its construction, which he did in a very faithful manner, presenting carefully drawn plans of the building and a full description, not only of the building itself, but of its surroundings. From the letter accompanying these plans, I quote the following:

"Dark, damp and unwholesome as the cells are, and must be from the nature of their construction, a prisoner confined within their gloomy walls for a longer or shorter time, as the case may be, invariably suffers from impairment of his general health.

"How can it be otherwise, when day by day he is deprived of that which is essential to his very existence, and which is not denied to the lowest of the animal creation — pure air, sunlight and exercise.

"I venture to say, that it would be a difficult task for any one to find within the limits of this state, a more unfit receptacle for the incarceration of those belonging to the criminal class. In more than one instance, to my knowledge, it has happened that prisoners with predisposition to tubercular disease have been made invalids prematurely, and for the remainder of their lives, by reason of the unsanitary conditions to which they have been subjected, by confinement in this prison house, *within whose cells a ray of sunlight never penetrates*, nor a sufficiency of pure air for respiration.

"The humane visitor inspecting its cells for the first time would reach the conclusion at once, that in this age of the world and within the limits of a progressive civilization, the fact of man's thoughtless inhumanity to the unfortunate of his kind, is not a myth, but, on the contrary. a stern reality; nor could he resist asking the question, When will community learn to punish offenders against law, humanely and intelligently?"

After a careful examination and consideration of the construction and condition of this jail, the following resolution and instruction to the health officer was unanimously adopted by the board, and transmitted to Dr. Gott, to wit:

OFFICE OF THE STATE BOARD OF HEALTH,
APPLETON, Wis., November 10, 1877.

To the Health Officer of the town of Viroqua, Vernon county, Wis.:

DEAR SIR: Complaint having been made to this board of the condition of the Vernon county jail, situated at Viroqua, in said county, and, at the request of the board, diagrams and explanations having been furnished of the construction and appointments thereof, the following facts appear:

Three stone cells were constructed, each with an arched roof 7 feet 6 inches in height to the center of the arch. One of these cells is 6x7 feet in size, the others 7x9 feet. In the rear of each cell is a window, 6 inches in width by 20 inches in length; and in the upper part of each door is an aperature 5 inches in width by 10 inches in length. In the rear end of each cell is an open water-closet, which discharges into a vault from 3 to 4 feet in depth. These vaults are without sewerage.

Separated from these three cells on the west by a hall three feet 4 inches in width, are two iron cells, each 6 feet 8 inches in height, length, 7 feet 4 inches; width, 6 feet 4 inches. These cells have each a window in the rear wall, 4x8 inches in size, and in the doors, which are of boiler iron, an aperature of the same size. In the rear of each of these cells is also a water-closet, emptying into a vault said to be about 8 feet deep, planked up from the bottom, without sewerage or convenience for being emptied, and which has not been emptied since the cells were constructed in 1872. Outside the frame building and terminating near the eaves, is a wooden shaft connecting with the vault, intended as a ventilating shaft.

Around these five cells, and inclosing them so as to admit of a hall on two sides, is erected a two-story frame building, with a stairway from the inside to the upper story, which is occupied by the sheriff and his family. The cells are each warmed in winter by a small stove.

It would be difficult to characterize this building as it deserves. Without sewerage, without ventilation, and so far as the prisoners are concerned, almost without sunlight, necessarily filled to a degree with mephitic gases from excrement, from the exhalations of the bodies of the inmates, and with respired air, robbed of its oxygen and charged with corbonic acid gas, it is absolutely certain that no human being can remain anywhere within the building, for any length of time, without endangering his health. Even the wooden ventilator from the vault under the iron cells is of little consequence, because, whenever the temperature outside the building is lower than inside, and consequently the air heavier, the current, if any, will be down the shaft instead of upward, thus forcing the foul emanations from the vault into the building.

Another fact: the water used on the premises, we are informed, is drawn from a cistern situated not more than fifteen feet from the vault under the iron cells. If not already affected, the water in the cistern will eventually be poisoned by the gases from the vault.

Slowly but certainly these gases will permeate the ground and pass through the wall of the cistern and infect the water. Many cases are on record where wells or cisterns, at a greater distance from a privy vault than this one, have been poisoned; and danger from such a cause is to be guarded against with more care, because water so affected cannot be detected by any change in its smell or taste. The appearance of virulent typhoid or other fevers is usually the first warning given.

It seems to the State Board of Health utterly impossible that a prison thus constructed can be remodeled so as to conform to the sanitary requirements of the imprisoned, and the health officer of the town of Viroqua is hereby instructed to request the board of supervisors of Vernon county to remove the prisoners from the jail within a reasonable time, and as soon as possible to erect a building which shall be constructed with reference to the physical wants as well as to the security of the prisoners.

In the meantime, such relief to the prisoners as it may be possible to secure should be given them at once, by disinfection and removal of the contents of the vaults or by closing them entirely and providing other accommodation for the necessities of the prisoners, and by additional means of ventilation, including, if necessary, the keeping open of the windows of the outside building day and night, regardless of the temperature. Pure air is one of the first essentials of healthful life, and no authority has the right to deprive a fellow being of its free enjoyment.

The health officer is further directed to report to this board what action is taken in the premises by the supervisors.

By order of the State Board of Health.

J. T. REEVE, M D.,
Secretary.

The following extracts from the final letter of Dr. Gott exhibit the effect of this action upon the board of supervisors of Vernon count:

"In obedience to the pointed and vigorous protest of the State Board of Health embodied in its resolution concerning the unsanitary condition of the Vernon county jail, our county board passed a resolution authorizing the expenditure of $150 for repairs on the jail, in which resolution they recommend that the following repairs and alterations be made, as absolutely necessary: 'That there be a new privy built at the northwest corner of the jail outside of the building, and communicating with the jail by means of a door cut through the wall, and that the privies now existing in the cells be filled up with lime and earth and the floor over the same be cemented or otherwise hermetically sealed; and that the said privy be built of oak plank with a stone vault ten feet deep, with a ventilator extending to the top of the jail building.'

"These alterations when made will, of course, render the structure less objectionable from a sanitary point of view, as they will serve to remove one source of the contamination of the air within the

cells. The cells, however, will remain as before, dark, damp and illy-ventilated, unfit for the incarceration of a human being even for a day. It remains to be seen whether the paltry appropriation of $150 will enable the contractor to make alterations in the now solid and closely-fitting cell-doors, grating them wholly or in part, and which are as essential to the comfort and health of the prisoner as the removal of the privy vaults. My own opinion is that the appropriation will not be sufficient to effect a so much needed improvement.

"In conclusion, I express the hope, and the more liberal and enlightened portion of this community, including the same element in our county board (unfortunately now in the minority), express the same, that in the forthcoming report of the State Board of Health, this abomination in the sight of God and man, in the shape of the Vernon county jail, will be fearlessly and relentlessly dealt with."

It is to be hoped that the more enlightened element of the board of supervisors of Vernon county will not let this matter rest here, but will, by such further action as is necessary, wipe out this reproach upon the intelligence, not only of the community, but of the state. It is proper to add that Dr. Gott exonerates both the sheriff and under-sheriff from blame in this matter, stating that they have done what they could with such means as have been placed at their disposal.

At the December meeting of the board, the following papers were read and approved, to wit.:

A report on Small-Pox, supplementary to the report of last year, by Dr. Griffin; a paper on the Water Supply of the State, in its Relations to the Health of the People, by Dr. Witter; and a paper on Village Sanitary Work, by Dr. Strong.

At this meeting, also, the committee on Revision of the Registration Law made a final report, in which they recommend that sections 3 and 4 of said law be wholly remodeled. The report having been previously discussed at much length, and meeting the cordial approval of the board, the committee were instructed to prepare a bill embracing the proposed amendment.

VITAL STATISTICS.

In this connection, it may not be improper for the secretary, as officially "The Superintendent of Vital Statistics," to state briefly

the objections which present themselves to the present registration law, and the reasons which have contributed to make it impossible to prepare for this report any useful exhibit of the vital statistics of the state.

These reasons are two-fold, the first being that such returns as have been made for the current year are yet in the hands of the registers of the several counties, the law providing that returns be reported by them to the Secretary of State annually, in the month of January. They are, therefore, as yet inaccessible for this purpose, but are known to be in the highest degree unsatisfactory.

Charged by its organic law to "study the vital statistics of the state and endeavor to make intellligent and profitable use of the collected records of death and sickness among the people," and regarding a knowledge of vital statistics as lying at the foundation of sanitary science, this board has made the question of registration one of continuous and anxious thought. Accepting this duty under a law which had been for eighteen years on the statute books and which was doubtless enacted almost solely for such legal purposes, as the establishment of the validity of marriage, the legitimacy of births, or the title to succession of property, they found that this law had, during all these years, been obeyed in so small a proportion of cases as to be absolutely valueless for purposes of sanitary study. On examination of the law, it was found to require returns of some facts not essential, yet to include nearly all that is desirable to the vital statistician, and there has been a continuous effort to secure for it general obedience. To this end every effort short of recourse to legal process has been resorted to, and as a result, there has been a very large increase in the number of returns made in every county of the state, and in some sections there has been a reasonably complete observance of the law so far as it affects physicians, clergymen or magistrates.

That the measure of this success might be ascertained as nearly as possible, a circular was sent to the register of deeds of all the counties, asking for a statement of the number of returns made for the first ten months of the present year as compared with the first ten months of the year 1876, it being impossible to get returns for the full year, and the fractional year being assumed to give a fair standard of comparison. Replies to this circular have been received from every county in the state and show an actual increase of 1,183

marriage returns, of 5,229 birth returns, and of 2,671 death returns, over the corresponding months of the year 1876.

This is apparently a gratifying approach towards correctness, but careful estimates, based upon the present population of the state with a death rate even lower than the American average, would show that at this rate a large part of the marriages, only about one-fourth of the births, and about one-sixth of the deaths are being returned.

The imperfection of the returns made is therefore manifestly very great. The chief reasons for it are apparent. A large class of the physicians of the state regard the innovation upon established custom which demands of them compliance with the registration law with disfavor, through failure to apprehend the value of the results sought to be obtained, and as a matter of fact either quietly disregard the law or render to it but partial and imperfect obedience, perhaps making such returns as may be attended with little labor or trouble. Not a few complain of the law as oppressive, and urge that the state, under penalties, demands of a citizen a service the performance of which involves no inconsiderable degree of labor and some actual expense, for which it offers no compensation. Prominent among the reasons offered to substantiate these complaints is the following, to wit:

That to properly fill the blanks for the returns required, not unfrequently necessitates the labor and expense of a special visit for the purpose of obtaining the necessary data. This is especially and most frequently urged with reference to returns of deaths where constructively the physician may be considered as "in attendance at the period of the death" of a person to whom he may have made but a single visit; and if at a long distance, as not infrequently happens, whose subsequent history he may be wholly ignorant of, the occurrence of death if reported to him at all, not being in such a way as will enable him to complete the required record. In view of these facts, while some have obeyed the law cheerfully, others have done so only under a strongly uttered protest, and still others have, it is feared, wholly disregarded it.

It may, perhaps, be pertinently inquired, Why have not the penalties prescribed by the law been enforced in known instances of disobedience? It will be sufficient here to reply, first, that it has been believed that to secure a public sentiment in favor of the

law would, for a time, be more powerful in insuring obedience to it, than the punishment of an offender; and, second, that there has been an unwillingness to resort to this extreme measure, at least without previous formal notice of such intention, in the face of a profound conviction that there were serious defects in the present statute, which must be remedied before any completeness of returns could be secured. This question has therefore been held in abeyance until an effort could be made to secure such additional legislation as seemed desirable in the case.

It is undoubtedly a fact that more than one-half of all the births occurring in the state are without medical attendance, many of them under the care of midwives, who are not recognized by the law, and many others under such casual assistance as can be obtained, especially in the more sparsely settled parts of the state; and while the law declares that it shall be the duty of parents to make returns of such cases, the difficulties in the way of securing this obedience with a population of such varied nationality seem practically insurmountable.

The proportion of deaths occurring without medical or surgical attendance is considerably smaller, yet, in the aggregate, the number is a very large one, and abundantly sufficient to destroy the value of any deductions made from statistics which ignore this fact, and the law fails to make it obligatory upon any one to report such cases.

In these various ways it is evident that many cases must escape record under the present law, even if rigorously enforced, and that unless some more successful plan of collecting returns be devised and secured, these returns must continue to be exceedingly imperfect and barren of interest from a sanitary standpoint. Their value for legal purposes is, however, unimpaired, each individual record being complete in itself and independent of all others.

How best to avoid these difficulties and to secure the nearest approach to that completeness of the records which gives them value to the vital statistician, is the practical question. The interests of sanitary science and of humanity require that the best practicable means to accomplish this result be adopted, and that this be without making demands upon the citizen, which he may regard as oppressive.

The plan of having all returns of births and deaths made by the

attending physician doubtless possesses some advantages over any other, but the practical obstacles to success in this direction, for reasons above given, are so great, that we believe that much better results may be secured by a radical change in the method of making the returns.

The committee appointed to consider this matter and to recommend what changes, if any, are desirable in the registration law, have, after careful consideration of the subject and examination of the laws of other states, prepared, with the hope of securing its passage by the legislature, the draft of certain amendments to the present statute which seem adapted to secure the most complete results at present attainable in this state.

Its provisions may be summarized as follows:

The amendments propose that physicians shall be wholly relieved from making returns of births, which are to be collected by assessors and reported by them to the register of deeds, where they are to be treated as under the present law.

With reference to deaths, the amendments propose that physicians shall be relieved from making formal returns to registers of deeds, but that they shall be required, immediately after the occurrence of the death of any person upon whom they may be in attendance, to make a certificate, on blanks to be provided them, which shall state the disease or cause of the death of the deceased. This certificate, involving the minimum of labor necessary to a record of the case, is required from physicians for the obvious reason that no other person is competent to give this information, and requires so little of labor that it is believed no one can reasonably object to it.

The amendments further propose that a permit shall be obtained for the burial of the dead, which permit shall be granted by the health officer or clerk of the township, city or village, on receipt of the physician's certificate of death as above stated, or under suitable provisions (as where there has been no physician in attendance) without such certificate, the clerk being required to see that all records are completed and to return them to the registers of deeds to be there treated as under the present law.

These health officers, or clerks, and also the assessors, are to receive a small fee for services, to be paid for by the township, city or village in which the service is rendered, and the additional amend-

ment provides that the penalties prescribed for non-performance of duties by other parties shall attach to them also, and that it shall be the duty of district attorneys to enforce these penalties.

It is doubtless true that some parts of the work of the Board are independent of this question of Vital Statistics, and that they can be pursued successfully without particular reference thereto. The importance of this matter is such, however, as demands that no pains or reasonable expense be spared in perfecting the method of collecting these statistics, and the adoption of the proposed change in the law will, it is believed, secure a completeness of result not in this state at present attainable in any other manner. The reduction of the number of those whose duty it is to make returns, and the limitation of them to paid officials, will render it easy for the proper authority to enforce the penalties of the law against delinquents.

WORK OF THE SECRETARY'S OFFICE.

The work of the Secretary's office has greatly increased during the present year, its correspondence having become a very extensive one, dealing with a great variety of interests, and exhibiting an encouraging appreciation of the value of this service on the part of the people of the state. A brief outline of the more prominent items of labor is herewith presented.

The liberal distribution of the first annual report directed by the Board, three thousand copies having been printed in addition to the number furnished the Board for distribution under ordinary legislative usage (and which were paid for out of the appropriation made to the Board), has been a most judicious measure. It is greatly to be regretted that the number could not be yet more largely increased, and the report printed in other languages. Numerous suggestions looking to this end have been made by correspondents.

The following circular was issued to accompany the report in the hope of calling direct attention to the work of the Board:

OFFICE OF THE STATE BOARD OF HEALTH.
APPLETON, Wis., March 20, 1877.

DEAR SIR: The accompanying "First Annual Report of the State Board of Health" is sent to you as one personally interested

in the objects for which the Board is laboring. It is desired to awaken, in all possible ways, an interest in sanitary science or preventive medicine, and to this end the Board solicits an investigation, not only of the report herewith sent, but also of the general field of work for which such organizations have been called into existence.

It will not, we presume, be questioned that organized and well directed effort has already done much to prevent the occurrence of devastating epidemics. It is not less true that improved sanitary surroundings, and careful attention to public and private hygiene are equally capable of controlling, and in many cases wholly preventing a large class of diseases which, originating chiefly through disregard of sanitary laws, are the cause of an untold number of premature deaths.

Under the researches of the sanitarian, the circle of diseases *known to be preventable* seems to be constantly widening. To enlighten the people concerning the causes of such diseases, to teach them how they may be escaped, is largely the work of the State Board of Health. May we not, in this effort, have *your* co-operation?

By order of the Wisconsin State Board of Health.

Very Respectfully,

J. T. REEVE, M. D.,
Secretary.

A circular was also issued with the reports sent to the physicians of the state, in which the duty of registration of birth and deaths was urged upon them, and at the same time, a circular was issued to the press of the state, in which a synopsis of the registration law was given. This circular was very generally published, and frequently attention was called to it by editorial notices.

A circular was also issued to registers of deeds, soliciting their active co-operation, and asking for information concerning the measure of compliance with the registration law, and for suggestions looking towards the securing of greater efficiency either by a change in the law, in the method of distributing blanks, the collection of returns, or in other particulars.

The replies to this circular contained numerous suggestions of change in the method of collecting the returns, generally recommending that they be made by some town officer, and that a small fee be allowed for this service, the opinion being freely expressed by some, that without such fees, connected with prosecution for delinquencies, no degree of accuracy could be expected.

state board. They shall also make especial reports whenever required to do so by the State Board of Health.

In accordance with the above, this board respectfully suggests to, and urges upon, your board the duty, if it has not already done so, of appointing as its health officer some physician possessing its confidence, with whom this board may hold future correspondence, and that this officer may at once be notified of such appointment. The board is aware that in many of the newer and agricultural townships there is no resident physician; but in such cases the appointment of the one to whom you would refer in case of emergency will enable the board to establish the desired communication.

For your own first report, you will please fill and return to this office the inclosed blank, and you are respectfully requested to send with it any additional information or published reports bearing on the public health which may have been issued by your Board. As the making of such reports is your duty under the law, any expenses for postage, stationery, etc., are properly included in the ordinary expenses of your office.

It is not presumed that you are in possession of such accurate knowledge respecting the prevalence of disease as will enable you to fill these blanks with absolute correctness in all cases, but it is hoped that by personal inquiry of proper sources you will arrive at such knowledge as will make your reports as nearly correct as possible.

The State Board also expects from you the rendering of special reports from time to time, which shall give to it early information of the outbreak or prevalence within the territory over which you have supervision, of any contagious disease, or disease dangerous to the public health, with the reputed source of such disease.

As a report will be required of you annually, the propriety of preserving this circular is suggested; and as it may aid you in the collection of memoranda for future reports, a duplicate of the blank inclosed for your present report is sent you, which you will please retain.

A copy of the first annual report of this Board is herewith mailed to your address.

By order of the Wisconsin State Board of Health.

J. T. REEVE, M. D.,
Secretary.

[Please fill every blank and return promptly to J. T. Reeve, M. D., Secretary State Board of Health, Appleton, Wisconsin.]

First annual report to the State Board of Health, by the clerk of the Board of Health for the* —— of ——, in the county of ——, and state of Wisconsin, for the year ending May 30, 1877.

To the Secretary of the State Board of Health:

SIR: The territory for which this report is made includes the corporate limits of the* —— of ——, in the county of ——, containing about —— acres of land. Its population numbers about —— inhabitants, and is composed chiefly of† ——.

The occupation of the citizens of this* —— is chiefly ——.

The nature of the soil in this* —— is as follows: ——

I estimate the number of acres of low or wet land from swamps, marshes, etc., to be about ——.

The proportion of this low or wet land which is capable of being efficiently drained is ——.

The number of acres of originally wet or low land that have been thoroughly drained in this* ——, during the last five years, have been about ——, and the effect of such drainage on the public health has been ——.

This* —— is‡ —— watered by the following streams and bodies of water, to wit.: —— ——.

The drinking water in this* —— is derived chiefly from ——, and the quality of the water is§ ——. The wells in this* —— are of the average depth of —— feet.

The diseases which have been most prevalent in this* ——, during the last year, have been‖ —— ——.

There have been in this *—— during the last year —— cases of, and —— deaths from scarlet fever. The general character of the disease has been ¶ ——

There have been in this * —— during the last year —— cases of, and —— deaths from diphtheria. The general character of the disease has been ¶ ——.

There have been in this * —— during the last year —— cases of, and —— deaths from small pox. The general character of the disease has been ¶ ——.

There are now in this * —— about —— cases of measles, —— of scarlet fever, —— of diphtheria, —— of small pox, —— of typhoid fever, of ——, ——.

The name of the health officer of this * —— is —— ——. He is by occupation a ——, and his post office address is ——.

The name of the clerk of this Board of Health is —— ——. He is by occupation a ——, and his post office address is ——.

This health board is governed by the following special laws in addition to the statutes of this state, to wit: ——.

During the past year, its most important acts have been ——.

Dated, ——. Signature, —— ——.

Clerk of the Board of Health for the *—— *of* ——.

Any additional information, written on a separate sheet, will be thankfully received, especially on the following points:

Reports of any cases of disease clearly traceable to local causes; such as impurity of drinking water from decomposing animal or vegetable matter, unhealthy food, stagnant water, etc.

Reports of any extraordinary amount of sickness, or of unusual fatality in special localities. Instances of spread of contagious diseases in any unusual manner, etc.

* Insert township, village or city.
† Give approximate proportion of nationalities represented.
‡ Insert poorly, well, abundantly, etc.
§ Hard or soft.
‖ In order of frequency.
¶ Mild or severe.

Report of cases of sickness or of death, the origin of which is clearly traceable to the occupation of the individuals.

Report of unusual sickness or fatality among animals.

Instances of injury to life or property from kerosene oil or other explosive burning fluids.

Your opinion as to the principal sources of danger to the health of the citizens in your locality, and suggestions whereby local causes of disease may be removed, etc.

To all such as failed to reply to this circular within a reasonable time, a second notice was sent calling attention to the fact, and in response to these circulars reports have been received from the clerks of 556 local boards of health, as shown by the following:

STATEMENT *showing the townships, cities and villages the clerks of whose Health Boards have reported to the State Board of Health for the year* 1877.

Adams County.—Adams, Big Flats, Leola, Lincoln, Monroe, New Chester, Preston, Quincy, Rome, Strong's Prairie.

Ashland County.—Ashland.

Barron County.—Cedar Lake, Clinton, Maple Grove, Prairie Farm, Shetek.

Bayfield County.—Bayfield.

Brown County.—Allouez, Ashwabanon, Bellevue, East Depere, Fort Howard, Humboldt, New Denmark, Pittsfield, Preble, Rockland, Scott, Suamico, East Wrightstown.

Buffalo County.—Alma, Belvidere, Buffalo, Dover, Fountain City, Gilmantown, Lincoln, Maxville, Milton, Modena, Naples, Nelson.

Burnett County.—Trade Lake, Wood Lake.

Calumet County.—Brillion, Brothertown, Charlestown, Rantoul, Stockbridge, Woodville.

Chippewa County.—Big Bend, Eagle Point, Flambeau, La Fayette, Wheaton.

Clark County.—Eaton, Fremont, Grant, Hewitt, Levis, Lynn, Mayville, Mentor, Pine Valley, Sherwood Forest, Thorp, Unity, Washburn, Warner, Weston, York.

Columbia County.—Arlington, Caledonia, Columbus Town, Columbus City, Courtland, Dekorra, Ft. Winnebago, Hampden, Leeds, Lewiston, Lodi, Lowville, Marcellon, Otsego, Pacific, Springvale, West Point, Wyocena.

Crawford County.—Clayton, Eastman, Haney, Marietta, Prairie du Chien, Seneca, Wauzeka.

Dane County.—Albion, Berry, Black Earth, Blooming Grove, Blue Mounds, Burk, Christiana, Cottage Grove, Cross Plains, Deerfield, Dunkirk, Dunn, Madison, Oregon, Perry, Pleasant Springs, Roxbury, Rutland, Stoughton, Vermont, Vienna, Windsor.

Dodge County.—Burnett, Clyman, Elba, Fox Lake, Hustisford, Lebanon, Le Roy, Lomira, Oak Grove, Portland, Rubicon, Randolph, Shields, Theresa.

Door County.— Bailey's Harbor, Brussels, Egg Harbor, Forestville, Gardner, Gibraltar, Liberty Grove, Sevastopol, Washington.

Douglas County.— Superior.

Dunn County.— Dunn, Eau Galle, Elk Mound, Grant, Lucas, Menomonie, New Haven, Peru, Rock Creek, Sheridan, Sherman, Taintor, Tiffany, Weston.

Eau Claire County.— Bridge Creek, Brunswick, Drammen, Fairchild, Ludington, Otter Creek, Seymour.

Fond du Lac County.— Ashford, Auburn, Byron, Eden, Fond du Lac, Forest, Friendship, Marshfield, Metomen, Oakfield, Ripon, Rosendale, Taycheedah.

Grant County.— Beetown, Boscobel, Cassville, Castle Rock, Ellenboro, Glen Haven, Hickory Grove, Jamestown, Liberty, Lima, Little Grant, Marion, Millville, Mount Hope, Paris, Patch Grove, Platteville, Watterstown, Wingville, Woodman.

Green County.— Adams, Brooklyn, Clarno, Decatur, Monroe, New Glarus, Washington.

Green Lake County.— Kingston, Manchester, Marquette, Princeton, St. Marie, Seneca.

Iowa County.—Clyde, Dodgeville, Linden, Mifflin, Mineral Point, Ridgeway, Waldwick.

Jackson County.—Alma, Black River Falls, Hixton, Manchester, Northfield, Springfield.

Jefferson County.— Concord, Hebron, Ixonia, Jefferson, Koshkonong, Lake Mills, Milford, Oakland, Palmyra, Sullivan, Sumner, Waterloo, Watertown.

Juneau County.— Armenia, Clearfield, Fountain, Germantown, Kildare, Lemonweir, Lisbon, Lyndon, Marion, Necedah, Orange, Plymouth, Seven Mile Creek, Wonewoc.

Kenosha County.— Brighton, Paris, Randall, Salem, Somers, Wheatland.

Kewaunee County.— Ahnapee, Franklin, Montpelier.

La Crosse County.— Bangor, Barre, Burns, Farmington, Greenfield, Hamilton, Holland, Onalaska, Shelby, Washington.

La Fayette County.—Argyle, Belmont, Benton, Elk Grove, Fayette, Gratiot, New Diggings, Shullsburg, Wayne, White Oak Springs, Willow Springs, Wiota.

Lincoln County.—No returns.

Manitowoc County.—Cato, Coopertown, Eaton, Franklin, Manitowoc, Maple Grove, Meeme, Mishicott, Two Creeks, Two Rivers.

Marathon County.—Hull, Knowlton, Maine, Mosinee, Stettin, Wausau, Wein, Weston.

Marquette County.—Buffalo, Douglas, Moundville, Oxford, Packwaukee.

Milwaukee County.—Granville, Milwaukee, Oak Creek.

Monroe County.—Angelo, Byron, Clifton, Glendale, Greenfield, Jefferson, La Fayette, La Grange, Leon, Lincoln, Little Falls, New Lyme, Portland, Sheldon, Sparta, Wellington, Wilton.

Oconto County.—Little Suamico, Oconto, Pensaukee, Peshtigo, Stiles.

Outagamie County.—Appleton, Black Creek, Center, Cicero

Dale, Ellington, Freedom, Grand Chute, Hortonia, Kaukauna, Liberty, Maine, Maple Creek, Osborn, Seymour.

Ozaukee County.—Fredonia, Grafton, Mequon, Port Washington, Saukville.

Pepin County.—Frankfort, Lima, Waterville.

Pierce County.—Clifton, Diamond Bluff, Ellsworth, El Paso, Gilman, Hartland, Maiden Rock, Martell, Oak Grove, Rock Elm, Salem, Spring Lake, Trenton, Trimbelle.

Polk County.—Alden, Balsam Lake, Black Brook, Farmington, Licoln, Luck, Milltown, St. Croix Falls, West Sweden.

Portage County.—Amherst, Belmont, New Hope, Pine Grove, Plover, Sharon, Stockton.

Racine County.—Dover, Mount Pleasant, Raymond, Rochester, Yorkville.

Richland County.—Akan, Bloom, Buena Vista, Forest, Henrietta, Ithaca, Marshall, Orion, Richland, Rockbridge, Sylvan, Westford, Willow.

Rock County.—Avon, Beloit—town, Beloit—city, Clinton, Fulton, Harmony, Janesville, Johnstown, La Prairie, Magnolia, Newark, Plymouth, Rock, Turtle.

St. Croix County.—Baldwin, Cady, Cylon, Hudson, Pleasant Valley, Somerset, Springfield, Stanton, St. Joseph, Warren.

Sauk County—Baraboo, Bear Creek, Delton, Excelsior, Fairfield, Franklin, Freedom, Greenfield, Honey Creek, Ironton, La Valle, Merrimack, Prairie du Sac, Spring Green, Sumpter, Troy, Washington.

Shawano County—Almon, Angelica, Belle Plaine, Green Valley, Grant, Hartland, Herman, Howe, Lesser, Maple Grove, Navereno, Pella, Richmond, Seneca, Shawano, Waukechon.

Sheboygan County—Greenbush, Herman, Lima, Mosel, Sheboygan, Sheboygan Falls, Sherman.

Taylor County—Chelsea, Medford, Westboro.

Trempealeau County—Arcadia, Caledonia, Dodge, Hale, Lincoln, Pigeon, Sumner, Trempealeau.

Vernon County—Christiana, Forest, Genoa, Greenwood, Hamburg, Harmony, Kickapoo, Liberty, Stark, Sterling, Webster.

Walworth County—Bloomfield, East Troy, Elkhorn, La Grange, Linn, Spring Prairie, Sugar Creek, Troy, Walworth, Whitewater.

Washington County—Addison, Erin, Germantown, Jackson, Kewaskum, Polk, Richfield, Schleisingerville, Wayne, West Bend.

Waukesha County—Brookfield, Lisbon, Merton, Mukwonago, New Berlin, Ottawa, Summit.

Waupaca County—Bear Creek, Caledonia, Dayton, Dupont, Farmington, Fremont, Helvetia, Iola, Larrabee, Lebanon, Matteson, Royalton, Scandanavia, Union, Waupaca.

Waushara County—Aurora, Coloma, Dakota, Deerfield, Marion, Mt. Morris, Oasis, Plainfield, Poysippi, Richford, Rose, Springwater.

Winnebago County—Black Wolf, Menasha, Neenah, Nepeuskun, Oshkosh, Poygan, Rushford, Winchester, Winneconne, Wolf River.

Wood County—Auburndale, Lincoln, Marshfield, Remington, Seneca, Sigel, Wood.

These reports have all been copied into a manuscript volume, and put the board in possession of much valuable information concerning the sanitary condition of the state, enabling it to map out the location of some of its chief epidemics, and to study them in their relations to local unsanitary conditions. The instances are numerous, however, where substantially the following statement is made, which I copy from a report which comes to hand as I write: "There having been no board organized, and not having given the matter any part of my attention, I am entirely unable to fill out the blanks in this sheet with any degree of correctness." This is to be expected to a great extent at first, but in view of the importance of the subject, it is hoped that such observations and memoranda of prevailing diseases, in relation to their history, progress and fatality, will be made as will enable clerks of local health boards to give increasingly intelligent answers to the annual and special inquiries of the board.

These clerks are asked to remember that *the law makes it their duty to report the required items, whether the boards they represent have ever assembled in the capacity of a health board or not*, and they are further asked to remember that, at least until health officers shall have been appointed, the board is dependent upon them for their best judgment of the amount and character of prevailing sickness and of local unsanitary conditions. They will also contribute very much to the knowledge of the board by promptly and voluntarily reporting the outbreak of any diseases considered dangerous to the public health.

A number of the clerks of local boards have accompanied their formal reports with letters containing additional information of interest, from two or three of which, I quote as follows:

Wood.—In this township of three hundred inhabitants, there have been, in the last two years, but four deaths, one from inflammation of the bowels, one from drowning, one from congestion of the lungs and one from diphtheria.

The land in this town is high and rolling, the water is pure, and there are no swamps or overflowed lands but what are drained or capable of being drained.

This town has been settled twenty-seven years, and in that time the town burying ground contains but thirteen graves. I consider this one of the healthiest countries I ever saw.

Respectfully, J. R. DAWES,

Clerk of the Board of Health of the town of Wood, Wood county.

Washington. — We have had but one death in this town during the year. It is many years since we had a case of measles, whooping cough or other of the diseases mentioned in the report. We had the small-pox in 1873 — never before or since.

I have been here since 1852. I believe a healthier town than ours would be hard to find. We have three wells on these islands, one of which is never used. I should think it would be unsafe to use it, as there are a barn and two privies near to it.

The water in the settlement is mostly hauled from the lake, except what is caught in cisterns. A few good wells would be a blessing, but it would be expensive, as there would have to be deep boring done through limestone.

We have had no saloons on the islands these thirteen years, which ought to be counted in our favor.

Respectfully, ROBERT SEVERS,

Clerk of the Board of Health of the town of Washington, Door county.

PATCH GROVE.— One evident cause of typhoid fever, in some years very prevalent here, is impure water from wells and even springs which receive impurities from outhouses, stables, pig pens, etc; evident because confined to persons who use such water.

The following matters need examination and correction: 1. Throwing bodies of dead animals into streams of water — a quite common method of disposing of the same. 2. Killing and disposing of diseased animals for food, a number of cases having fallen under the observation of the writer hereof.

Respectfully,

J. W. BIDWELL,

Clerk of the Town of Patch Grove, Grant County.

HEALTH PHYSICIANS.

At a later date the following circular was prepared and sent to the Health Physicians or other health officer of all Local Health boards. The replies to it have not been numerous but have embraced some reports conveying useful information. A few extracts from these reports will appear among the extracts from special correspondents:

OFFICE OF STATE BOARD OF HEALTH,
APPLETON, Wis., August 26, 1877.

To the Health Physician, or the Health Officer of the Local Board of Health:

DEAR SIR: By the laws of Wisconsin, the regularly elected officers of every township, village or city in the State, are a legally constituted Board of Health, the chairman and clerk of such township,

village or city being ex officio chairman and clerk of such Board. Every such Board has definite relations to the State Board of Health, and is by law required to report to it both by its clerk and by its health officer. The power to appoint physicians as health officers is given to Local Boards, and is recommended in all cases where practicable, because physicians, as a class, can best appreciate all those influences which are sources of danger to the public health.

In reply to the requests of several who have been thus appointed, for an outline of their duties and for the general information of all health officers, this circular has been prepared. It is impossible to point out in detail their various duties. To them and to the boards they represent is committed the guardianship of the health and lives of their fellow citizens. Those who are thus honored and confided in, should therefore seek by special study to prepare themselves for this responsibility. They should be students of sanitary science — men of skilled judgment — who are capable of leading both the boards they represent, and the people, in sanitary knowledge, and of giving to them such practical hygienic instruction as will tend to avert disease, or restrict it to its smallest possible limits.

As worthy the most careful observation and study of such officers, we recommend such topics as the foods and clothing, the habits and occupation of the people, the construction and ventilation and drainage of their habitations, and of their public buildings and school houses, the location of their wells, or other water supply, with reference to cesspools, privy-vaults, barn-yards, or other sources of soil contamination from filth, the drainage of swamps and low lands, etc.; in short, of everything which can unhealthfully affect the character of air, of water, or of soil, to the purity of which every man has an inherent right.

Of necessity, the various unsanitary influences affecting particular localities can be known fully only to those favorably situated for studying those influences. The health officer of every local board of health should therefore seek to inform himself concerning his special locality, and particularly to understand the unsanitary conditions which favor the presence of that large class of diseases which are known to be preventable. Such knowledge will enable him promptly to advise with reference to the probable approach of such diseases, and of the local causes contributing thereto, to the end that such sanitary rules may be promulgated and enforced as will avert the threatened calamity, or, if this be impossible, to check and stay the progress of disease. In many cases of contagious disease, this may be accomplished by the thorough isolation of the first persons sick, and thus destructive epidemics may be averted. In all such cases the local board, under the direction of the health officer, should act with the utmost promptness. Some practical hints in this direction, in reference to small pox, may be found in the first annual report of this board, at page XL, and a circular, with suggestions as to the limitation of scarlet fever, is inclosed herewith.

Reference to the power vested in boards of health is made at some length in a circular, which has been sent to the clerk of your Board, to which you are referred. It should be found on file in his office. Such power will be found to be ample, and in case of necessity, almost absolute, and undoubtedly your authority should at times be exercised for the abatement of those nuisances by which the "carelessness, the avarice, or the ignorance" of one endangers the health of many. Upon the right understanding of his duties, the practical application of his sanitary knowledge, and the judicious exercise of his authority will the usefulness of a health officer chiefly depend.

This Board respectfully urges upon the officers of Local Boards the importance of the diffusion of sanitary knowledge among the people. The public mind is thirsty for knowledge. The public press is open and willingly spreads health items upon its pages. Let health officers avail themselves of this means of reaching the people. This board will at any time cheerfully indicate to any health officer such works as will give specific knowledge and instruction in regard to the causes of disease and their removal.

Section 7 of the act organizing the State Board of Health, reads as follows:

Section 7. It shall be the duty of the health physician, and also of the clerk of the local board of health in each township, city and village in this State, at least once in a year, to report to the State Board of Health their proceedings, and such other facts required, on blanks, and in accordance with instructions received from the State Board. They shall also make especial reports whenever required to do so by the State Board of Health.

You will therefore see that the Law requires that you shall make report to this office. In this way the experience and research of one may be made to contribute to the good of all. In compliance with this provision, you will please communicate the following information, sending the same to this office, on or before the 20th of September.

1. Your name, occupation and address—(Post Office, Town and County).

2. Name of your Board, the number of its members, the frequency of its stated meetings, and whether or not a record of the same is kept.

3. A brief statement of the diseases which have prevailed in your Township, Village or City for the year ending September 1, 1877, stating the type of such disease (whether mild, severe, malignant, etc.).

4. Particular reference to the existence of any local cause of disease, and whether capable or not of being removed.

5. Please report at length any cases of disease clearly traceable to such local causes.

6. Please state as correctly as possible, the number of deaths from consumption during the past year, and how long the persons dying had been residents of your township.

7. Please report at length, particulars of any case of injury to

life or property, from the use of kerosene or other explosive burning fluids.

8. Please give your opinion as to the principal sources of danger to the health of the citizens of your locality.

9. Please state the number of artesian wells within your corporate limits, the depth of each, and the amount and character of the water flowing therefrom.

As annual reports will be expected from you and your successors, you are requested to preserve the circulars received from this office, and as these reports are required of you by law, your expenses for postage, stationery, etc., should be borne by your township, village or city treasury.

You are cordially invited to free and frequent correspondence with this Board, and particularly requested to keep it informed of the appearance of any disease assuming an epidemic form, or of *the appearance of any contagious disease, or disease dangerous to the public health.*

You will confer a favor if you will ascertain if the clerk of your board has made the report required from him, and in the event of his having failed to do so, of urging the importance of immediate attention thereto.

By direction of the Wisconsin State Board of Health.

Very respectfully,

J. T. REEVE, M. D.,
Secretary.

Accompanying this circular is sent you a small package of circulars on the "Treatment of the Drowned," which you are requested to distribute to your physicians, or others, as judiciously as possible.

All intelligent action must, of course, be based upon a correct knowledge of facts, and as a stimulating and suggestive help to all health officers, we would advise you to provide yourself with some *Sanitary Journal.* Of these there are several. *The Sanitarian*, published by A. N. Bell, M. D., 82 Nassua St., New York, at $3.00 per annum, is a monthly Journal, exclusively devoted to sanitary science, and receives the cordial commendation of this Board.

It is manifest, from the meager response to this circular, as well as from the very frequent replies of clerks of local health boards, that but few health physicians have been appointed. The efficient exercise of the functions of a local board of health will, however, be greatly promoted by the appointment of such officers in every city, village and township. The general statutes confer on all legal health boards the power to appoint such officers, and the law organizing this board implies the exercise of this power in providing that health physicians, as well as clerks of local boards of health, shall report to this board.

It is eminently desirable that such appointments shall be made

in all cases where it is possible; that the health physician shall be selected with reference to special qualifications for this office, and that when elected, he shall be the executive officer of the board. It will be both justice and economy that such an officer shall be paid for his services, and that he be required to carefully inquire into the sanitary condition of the territory over which he has jurisdiction, and to abate or remove all causes of disease so far as it may be possible. Such a course could hardly fail to be in the highest degree beneficial to any community.

SPECIAL CORRESPONDENTS.

For very much of the information needed by the board in reference to the sanitary condition of the State, it is of course dependent on the co-operation of others, and many of the facts desired, must. of necessity, be obtained by direct solicitation.

The importance of this matter is such, that unwillingness was felt to trust to chance selections or to annoy with correspondence those whose prior engagements or lack of interest in the work was such as prevented their co-operation. The following circular was therefore prepared and sent to a number of prominent physicians, the most of whom have signified their willingness to accept this office.

OFFICE OF STATE BOARD OF HEALTH,
APPLETON, Wis., ——, 187—.

——— ———,

DEAR SIR: This Board is desirous of securing a corps of special correspondents, located in different parts of the state, which will embrace, irrespective of any official relation such correspondents may hold to local boards of health, men who are in full sympathy with the objects for which this board is laboring, to wit: the extension of sanitary knowledge among the people, and the education of the people in the nature and cause of preventable diseases.

To secure the full benefit of this relation, the board is persuaded that it needs as such correspondents, men who by direct acceptance of this office become identified with the board, to whom it can appeal for any desired information, and from whom may be expected such special interest in its work as will prompt to the free communication of any facts they may deem worthy of its notice.

The board desires *your* acceptance of this position of special correspondent, and such acceptance will be regarded as an earnest of your cordial co-operation with it, and an assurance that you will

answer any questions which may be addressed to you; and that you will fully advise the board of any facts coming to your knowledge, whether referring to your own vicinity or of a general character, by which its work can be made more useful to the people.

An early reply to this invitation is solicited, for which a stamped envelope is enclosed.

By direction of the Wisconsin State Board of Health.

J. T. REEVE, M. D.,
Secretary.

To all such as formally accepted this office, thus pledging themselves to this co-operation, the following circular was sent:

OFFICE OF WISCONSIN STATE BOARD OF HEALTH,
APPLETON, August 28, 1877.

DEAR SIR: This board is desirous of obtaining from its special correspondents, such definite information as they may be able to give, of the diseases which have been prevalent in the state during the past year, and of the causes contributing thereto; also answers to some questions which will enable it to form correct estimates on certain points.

In a circular which has very recently been issued to the health officers of local boards of health, the following questions are asked:

"Please give a brief statement of the diseases which have prevailed in your township, village or city for the year ending September 1, 1877, stating the type of such diseases (whether mild, severe, malignant, etc).

"Particular reference to the existence of any local causes of disease, and whether capable or not of being removed.

"Please report at length any cases of disease clearly traceable to such local causes.

"Please report at length particulars of any case of injury to life or property from the use of kerosene or other explosive burning fluids.

"Please give your opinion as to the principal sources of danger to the health of the citizens of your locality."

The board will be pleased to have you answer these questions also, not confining your answer to particular corporation limits, but embracing, rather, natural geographical or sanitary divisions. Where it is practicable, it will be more convenient if county lines be observed — as for instance, a report may cover the entire county, or some division of the same, yet if the course of disease can be better traced by following the course of rivers or other natural land marks, please observe such distinctions, clearly defining the boundaries reported upon.

Please also to give us any facts of interest concerning the sanitary condition of the division referred to, for the past five or ten years, embracing the history of any notable epidemics which have occurred, and any changes in the healthfulness of the locality, favorable or unfavorable, from the increased clearing up of the country

by settlers; by the drainage of swamps or drying of low lands from removal of forest trees; by the building of dams, canals, or other public works.

Please also to state the general condition of the school houses and other public buildings in your vicinity as regards their location and construction with reference to proper lighting, heating, ventilation and means of escape in case of fire; calling particular attention to buildings notably bad in these respects. State also the injurious effects, if any, especially to pupils in public schools, traceable to defects in any of these particulars.

The board will also be glad to hear your estimate of the extent to which the present registration law is observed by the physicians of your vicinity, and what proportion of the births and of the deaths which occur in your vicinity are without the attendance or knowledge of physicians. Any suggestions looking toward the securing of more complete returns will be gratefully received.

In indicating to you in this manner some of the points on which information is desired, the board wishes it to be understood that any information on any topic bearing on the work before us will be at all times acceptable. It is the hope of the board to secure as its corps of special correspondents men who are so fully in sympathy with the work undertaken by it, that they will, as they have opportunity, make independent observations and communicate the results thereof to the board. To this end it solicits the utmost freedom of correspondence. If it is desired that any portion of this correspondence be considered as confidential, in the sense that the board will not be at liberty to make extracts from it for publication if desired, the writer will please state that fact in his communication.

There are sent you herewith a few copies of a circular on "Treatment of the Drowned," for distribution; also a copy of the law organizing this board; of the registration law; and of each of the general circulars which have been issued by the board.

A stamped envelope is enclosed for your reply, which is requestd as soon as the first of October.

By direction of the Wisconsin State Board of Health.

J. T. REEVE, M. D.,
Secretary.

The response to this circular has been a very gratifying one. A few, whose co-operation had been promised, have failed to respond, but from many there have been received communications which have been both encouraging and helpful.

This part of the work is regarded as yet very incomplete, and it is hoped to include in the list of special correspondents, representatives of every section of the state. This service is designed in no way to interfere with the reports of the regularly appointed health officers, or with the continuance of the voluntary contributions of

those who may feel an interest in the work, which contributions are always welcomed.

From the correspondence elicited chiefly by this circular, numerous quotations have been made which will be presented in another article. The effort is made to present in this selection such extracts as illustrate the spirit of the correspondence, and as appears likely to be of most general interest. Thanks are due not only to these correspondents, but to many from whose letters no quotations have been made, for painstaking accuracy in the collection of statistics and for information of permanent value. It is regretted that the limited space at command has made it necessary to make these quotations in many cases very brief.

CIRCULARS RELATING TO THE PUBLIC HEALTH.

Shortly after the first meeting of the Board, and in pursuance of its directions then given, a circular on the restriction of

SCARLET FEVER AND DIPHTHERIA

was prepared. This circular was distributed to the press of the state and by it very generally reprinted, thus securing for it a very wide circulation. In addition to this, large numbers were distributed to health officers, physicians and others. In La Crosse the circular was reprinted by the health officer, for distribution in that locality, "especial pains being taken to place a copy in the hands of every family where a case of scarlet fever or diphtheria was reported."

The requests for copies or packages of this circular have been so numerous that the supply first printed was found to be insufficient, and a second large addition was accordingly provided. The circular is as follows:

OFFICE STATE BOARD OF HEALTH,
APPLETON, Wis., March 20, 1877.

SCARLET FEVER AND DIPHTHERIA

are the diseases now most prevalent in the state, in many places assuming the form of an epidemic of great severity, and of unusual fatality.

Both of these diseases are highly contagious, and both of them are properly classed among the preventable diseases, but unfortu-

nately we have not for their prevention any such specific as Vaccination has proven to be for Small Pox. Reliance must then be placed upon the less direct preventative measures by which we may reasonably hope to stay their progress.

The State Board of Health desires to impress the importance of this matter upon our citizens, and presents the following Sanitary Rules, by the observance of which the spread of these diseases may be largely prevented.

The contagious character of

SCARLET FEVER

is little less marked than that of Small Pox, and like it, may be induced not only by contact with, or coming into the presence of, those who have the disease, but it may be retained in and conveyed by various articles which have been subjected to the infected atmosphere. In numerous instances bedding or clothing, long disused, have been the means of communicating the disease. In like manner the infection may be retained indefinitely in books, carpets, wall paper or furniture. In these various ways the disease may be conveyed and communicated under circumstances otherwise inexplicable. The contagious character of the disease does not cease with its active symptons, but is perhaps peculiarly great during the period when the old skin is being thrown off, minute particles of which may adhere to the clothing of the most casual visitor, and be thus conveyed directly from the sick to the well. To a great extent this danger may be lessened, and the comfort of the patient at the same time promoted, by thoroughly and frequently anointing the whole body, including the scalp, with some fatty substance, such as lard or olive oil, which mechanically imprisons the particles of skin as they separate.

Scarletina, Scarlet Rash, Canker Rash and Rash Fever are simply other names for Scarlet Fever, and there is no safety in the popular belief that they are not dangerous. No form of Scarlet Fever is free from danger, and the most severe forms of the disease may follow exposure to the mildest.

ISOLATION.

No pains therefore should be spared to prevent communication with a person sick with Scarlet Fever, but such person should be at once confined to a well ventilated room, the most remote from family occupancy (an upper room, if possible), from which should be removed all carpets, rugs and unnecessary furniture of every kind, and especially all kinds of woolen. There should be absolutely no visitors to this room except the physician and necessary attendants, and this isolation of the sick person should continue until the roughness of the skin, due to its peeling off, shall have disappeared.

During the sickness, some disinfecting solution should be kept constantly in the room (that recommended by the New York Board of Health is composed of eight ounces of sulphate of zinc, three ounces of Carbolic acid and three gallons of water), in which al

infected or soiled clothing from the patient should first be soaked, and then boiled for at least an hour, and it is recommended that nurses wear only such clothing as can be thus purified. All infected clothing should be kept separate from other clothing, and washed by itself. It is better if bits of rags which can be burned, be used in place of handkerchiefs in the sick room.

All discharges from the patient's body should first be covered with the disinfecting solution, then instantly removed from the house, and if possible buried.

Throughout the sickness an abundant supply of fresh air should be admitted to the room, a direct draft upon the patient being avoided.

DISINFECTION.

At the close of the sickness (after the removal of the patient) the room ought to be thoroughly cleansed as after Small Pox, first by burning sulphur in it, two or three pounds being placed in a safe iron vessel over a tub of water to guard against fire, and ignited, the doors, windows and chimney flues being first carefully closed. The room should remain closed for several hours, after which thorough ventilation, scrubbing the floor and woodwork with the disinfecting solution, whitewashing and re-papering the walls will fit the room for re-habitation.

Rooms may also be disinfected by chlorine gas, which is rapidly generated by pouring muriatic acid on chloride of lime. A pint of the acid being sufficient for four or five pounds of the lime, which should first be placed in a wooden or earthen vessel and moistened with water. During this process, the room should be closed as for the sulphur fumigation, and during either process, articles to be disinfected should be as much as possible so suspended or spread out as to be most fully exposed to the vapor. Heat will also it is believed effectually destroy the poison germ, and articles may be disinfected by being placed in an oven and subjecting them to a temperature which shall be considerably above that of boiling water.

"In case of death, the funeral service should be strictly private and the corpse should not be exposed to view," a neglect of which humane precaution has in numerous instances cost the lives of sympathizing friends.

To carry out such measures thoroughly, says Dr. Aitken, "requires wisdom and self-denial on the part of relatives and friends,—but if it were possible to begin to-morrow and to carry them out in every case, Scarlet Fever would have ceased to exist at the end of two months, and it is possible or even probable that it would never return." If it be not possible to carry them out fully, it is possible so to approximate thereto, as to save many of the lives of our dear ones.

DIPHTHERIA.

The contagion of diphtheria is not so strongly marked as that of scarlet fever, yet sufficiently so to call for exercise of very great care. The disease is spread by the exhalations of the sick poison-

ing the air of the sick room, or by the direct contact of the diphtheria exudation, which may adhere to infected articles, or it may be communicated by spitting, sneezing or coughing, and not infrequently in the act of kissing one who has a simple sore throat which is scarcely noticed, may communicate a virulent diphtheria to another.

The disease, usually spread in some of these ways, may also with less certainty be spread by infected clothing, or furniture or rooms, to which the poison sometimes clings with great tenacity and for a long time.

To check this so frequently fatal disease, the same system of

ISOLATION AND DISINFECTION

recommended for scarlet fever is applicable and should be rigidly enforced, and during the prevalence of the disease, no sore throat, however apparently trivial, should be neglected. Let the family physician at once be consulted.

Finally,

CLEANLINESS AND PURITY OF AIR ARE THE DEADLY ENEMIES OF ALL CONTAGION.

Secure these for your children, with pure water, wholesome food and comfortable clothing. Remove from cellars and yards and alleys every kind and source of filth; see that drains and cesspools are in perfect repair; that there be no leakage of foul gases about your premises, and you will do very much to keep from your homes not only scarlet fever and diphtheria, but diseases of every kind whether it be that "pestilence which walketh in darkness" or that "destruction which wasteth at noon day."

By order of the Wisconsin State Board of Health.

J. T. REEVE, M. D.,
Secretary.

P. S.—Health Officers or others desiring copies of this circular, or of one previously issued by the Board on Small Pox, may obtain them in any desired quantity by addressing the Secretary.

The plain and practical rules for

THE TREATMENT OF THE APPARENTLY DROWNED,

Prepared and published by the Michigan State Board of Health, having been approved by this Board, the following circular was issued in August last. This circular is simply a reprint of the issue of the Michigan State Board of Health with the exception that the two latter paragraphs have been added. Two editions of this circular were printed, one large for posting in public places, and one of convenient size to insert into ordinary letters.

Copies of this circular have been sent to the health officers of

every town in the state, for distribution to physicians. Packages of them have also been sent to all special correspondents, and large numbers have been sent to other parties.

TREATMENT OF THE DROWNED.

Two things to be done: Restore breathing; restor eanimal heat.

RULE 1.— Remove all obstructions to breathing. Instantly loosen or cut apart all neck and waist bands; turn the patient on his face, with the head down hill; stand astride the hips with your face towards his head, and, locking your fingers together under his belly, raise the body as high as you can without lifting the forehead off the ground (Fig. 1), and give the body a smart jerk to remove mucus from the throat and water from the windpipe; hold the body suspended long enough to slowly count one, two, three, four, five, repeating the jerk more gently two or three times.

RULE 2.— Place the patient on the ground face downward, and maintaining all the while your position astride the body, grasp the points of the shoulders by the clothing, or, if the body is naked, thrust your fingers into the armpits, clasping the thumbs over the points of the shoulders, and *raise the chest as high as you can*, (Fig. 2) without lifting the head quite off the ground, and hold it long enough to *slowly* count ONE, TWO, THREE. Replace him on the ground, with his forehead on his flexed arm, the neck straightened out, and the mouth and nose free. Place your elbows against your knees and your hands upon the sides of his chest (Fig. 3) *over the lower ribs and press downward and inward with increasing force* long enough to slowly count one, two. Then suddenly

let go, grasp the shoulders as before, and raise the chest (Fig. 2); then press upon the ribs, etc. (Fig. 3), These alternate movements should be repeated 10 or 15 times a minute, for an hour at least, unless breathing is restored sooner. Use the same regularity as in natural breathing.

Fig. 3.

RULE 3.—After breathing has commenced, restore the animal heat. Wrap him in warm blankets, apply bottles of hot water, hot bricks, or anything to restore heat. *Warm the head nearly as fast as the body, lest convulsions come on.* Rubbing the body with warm cloths or the hand, and slapping the fleshy parts may assist to restore warmth and the breathing also. If the patient can surely swallow, give hot coffee, tea, milk, or a little hot sling. Give spirits sparingly, lest they produce depression. Place the patient in a warm bed, and give him plenty of fresh air. Keep him quiet.

BEWARE!

AVOID DELAY. A moment may turn the scale for life or death Dry ground, shelter, warmth, stimulants, etc., at this moment are nothing — ARTIFICIAL BREATHING IS EVERYTHING — is the ONE REMEDY — all others are secondary.

Do not stop to remove wet clothing before efforts are made to restore breathing. Precious time is wasted, and the patient may be fatally chilled by exposure of the naked body, even in summer. Give all your attention and effort to restore breathing, by forcing air into and out of the lungs. If the breathing has just ceased, a smart slap on the face, or a vigorous twist of the hair will sometimes start it again, and may be tried incidentally, as may, also, pressing the finger upon the root of the tongue.

Before natural breathing is fully restored, do not let the patient lie on his back, unless some person holds the tongue forward. The tongue, by falling back, may close the windpipe and cause fatal choking.

If several persons are present, one may hold the head steady, keeping the neck nearly straight; others may remove wet clothing, replacing at once clothing which is dry and warm; they may also chafe the limbs, and thus promote the circulation.

Prevent friends from crowding around the patient and excluding fresh air; also from trying to give stimulants before the patient can swallow. The first causes suffocation; the second, fatal choking.

DO NOT GIVE UP TOO SOON. You are working for life. Any time

within two hours you may be on the very threshold of success without there being any sign of it.

In suffocation by smoke, or any poisonous gas, as also by hanging, proceed the same as for drowning, omitting effort to expel water, etc., from windpipe.

In suspended breathing from effects of chloroform, hydrate of chloral, etc., proceed by rule 2, taking especial pains to *keep the head very low*, and preventing closure of the windpipe by the tongue falling back.

Prevention is better than remedy—Teach the children to swim, and the death roll will be materially shortened. Very few, either boys or girls, would fail to acquire this art under a few lessons from a competent instructor, and none would fail to have removed a portion of that unreasoning dread felt when one unaccustomed to water is suddenly immersed. As an artificial aid in learning to swim, probably the best and safest is a piece of plank which, placed under the chest, will help to support the body and keep the head out of water while the strokes are being learned.

Dr. McCormick, in The Sanitary Record, makes valuable suggestions to those who cannot swim. *Paddle with the hands and tread with the feet.* Animals not habituated to the water when thrown into it at once commence to paddle and thus sustain themselves for hours. If a man wholly unable to swim will but imitate this process, and beat water with the hands and feet, or tread with the feet and paddle with the hands, he would keep himself afloat and be able to guide his movements sufficiently long in multitudes of instances to secure rescue. *Preserve presence of mind. Keep the arms under water.* Paddling with the hands alone will sustain the body—the action of the feet alone will do so. Follow these directions and you cannot sink.

The foregoing methods, rules and illustrations were devised and prepared by the State Board of Health of Michigan. The *Wisconsin State Board of Health* fully indorse them, and having added the two latter paragraphs, reprint the document for distribution throughout the state. Parties receiving duplicate copies or packages are earnestly requested to aid in its circulation, in the hope that valuable lives may thereby be saved. Any number desired for distribution may be obtained by addressing the Secretary at *Appleton, Wisconsin.* Communications on the subject solicited, and may be similarly addressed.

Please fasten this up in a conspicuous place. Study it thoughtfully, in order to act efficiently if occasion requires.

The continued prevalence of

SMALL POX

in the state, spread in many cases through the criminal negligence of local boards of health, created an unexpected demand for the circular on the prevention of this disease, requiring the printing of

a second edition. In view of the importance of the subject, and of the fact that some changes were made in the circular as re-issued, it is again presented.

OFFICE WISCONSIN STATE BOARD OF HEALTH,
APPLETON, Nov. 12, 1877.

SMALL POX.

During the last fifteen months small pox has appeared in 39 different localities in this state, and has caused the death of more than 425 persons, out of a total of over 1,600 cases of the disease.

These facts call for a renewal of words of advice, and of emphatic warning, from the State Board of Health. That such an amount of suffering, and the loss of so many valuable lives should have been caused by a disease so *absolutely preventable*, is a great reproach to the state, and fixes a grave responsibility both upon the individual citizen and upon the legally constituted local health boards.

We reiterate our matured conviction as set forth in our circular on this disease, dated December 16, 1876, that

SMALL POX IS PREËMINENTLY A PREVENTABLE DISEASE,

That we possess the means by which we may confidently expect to keep it from our homes, and from our communities, and that it never comes to either, except as the means known to be able to prevent it, have been neglected. It can maintain a continued existence anywhere, only through the ignorance or obstinacy of the people, or the inefficiency or criminal negligence of the local health authorities.

Fully impressed with this belief, we therefore urge upon the physicians and upon all good citizens of Wisconsin that they give to the lawful authorities such moral and material support as will enable them and compel them, in deference to public opinion, to institute such measures as will serve to arrest the progress of the disease and eradicate it from the state. These measures are the thorough *isolation* of every case that may occur, and the careful

VACCINATION AND RE-VACCINATION

of all who are exposed. The undersigned have unqualified confidence in the protective power of thorough vaccination, believing that it can render in all persons, PERFECT protection against any form of variolous disease — but to secure this protection, THREE conditions must be carefully observed:

1. *The Virus used must be vigorous and pure.* Enfeebled or deteriorated or improperly selected virus may produce spurious and wholly unprotecting sores. At best they give but an imperfect development of the vaccine disease, hence lead to a feeling of false security, and not unfrequently bring discredit upon the operation.

We recommend the use of Bovine Virus as being free from all

objections, safe in all cases, producing the maximum of protective influence, and being always available in any quantity needed.

2. *The operation must be skillfully and properly performed.* The careless and imperfect manner in which vaccination is often performed, and the utter lack of watchfulness of the result, or knowledge as to whether there has resulted a genuine, typical vesicle, is a grevious mistake. The operation should be conscientiously performed, and the development thereof carefully observed until it is KNOWN to be protective.

3. *Revaccination should be frequently practiced* to test the returning susceptibility of the system to the small pox contagion.

By a strict and universal observance of these rules we believe that small pox might be stamped out of existence. To neglect such rules is to endanger not only the life of him who neglects them, but also the lives of those with whom he associates. We believe there is no valid excuse for such neglect.

With regard to revaccination the facts are, that a certain number of persons are protected for life by one vaccination, while the protection of others extends to but a limited and variable period. Hence, as we are without the power to distinguish between these classes, revaccination is as essential as a primary operation, and should be performed at least every five years. It should also be performed at every season of an epidemic diffusion of the disease.

We recommend that local boards of health throughout the state take measures to secure the vaccination of all children in attendance upon the public schools, who have not been vaccinated within five years, and that they use their influence to impress this duty upon all citizens.

Should small pox unfortunately appear in any community, we earnestly recommend the adoption of the following rules:

ISOLATION.

Thoroughly isolate every case that may occur, and keep it so isolated until all danger that the disease can be communicated is past. If the patients be kept in a private house, it is better that the uppermost rooms of the house be used for the purpose; every person in the vicinity should at once be vaccinated without regard to any previous operation.

In case of death, the funeral and burial should be conducted with the strictest privacy, and should be under the direction of the health officer.

DISINFECTION.

At the close of the disease, articles which can be so treated, should be disinfected by being subjected to the action of boiling water, or may be baked in an oven at a temperature of not less than 212 degrees. Heat effectually destroys the poison germ. Such articles as cannot be so treated should remain in the room after the removal of the patient and be subjected to

SULPHUROUS FUMIGATION

which is effected by placing about three pounds of sulphur in a safe

and convenient vessel in the room with the doors, windows and chimney flues closed, and ignite it. The room should remain closed ten or twelve hours, after which, prolonged

VENTILATION

scrubbing the floor, and painting the wood work, with whitewashing and re-papering the walls, will complete the process and fit the rooms for re-habitation.

E. L. GRIFFIN, M. D., Fond du Lac,
JOHN FAVILL, M. D., Madison,
SOLON MARKS, M. D., Milwaukee,
JAMES BINTLIFF, Janesville,
J. T. REEVE, M. D., Appleton,
H. P. STRONG, M. D., Beloit,
G. F. WITTER, M. D., Grand Rapids,
State Board of Health.

P. S. Health officers or others desiring copies of this circular for distribution, or copies of the circular on "Scarlet Fever and Diphtheria," or "on the Treatment of the apparently Drowned," can obtain them in any desired quantity, by addressing the secretary, at Appleton.

The demand which has been made for these circulars has of late been a very large one, and the good influence they are exciting is illustrated by the following extract from a recent letter:

"DEAR SIR: I received the circulars on small-pox, and scarlet fever and diphtheria, and posted them in conspicuous places in this village. The placards have had a good effect, for my family have noticed open windows and cleaning up in many houses unused to such rough treatment."

This may, I think, be fairly considered as one of the means by which the board may attain its highest usefulness, and it may likewise be accepted as an indication of the desire of the people for sanitary knowledge. If both state and local boards of health will co-operate in the dissemination of that, and that only, which will fully and truly represent what is known concerning the nature, causation and prevention of disease, they will do much to lead the people from a blind trust in the teachings of that charlatanism and ignorance which hitherto has been their chief guide.

The press will be a willing co-operator in such work, and will cheerfully publish that which may be given to it on such authority, to the exclusion of much that is now found in its columns that is unreliable, injurious and demoralizing.

LIBRARY.

During the year, the president, while on a personal visit east, obtained a large donation to the library, chiefly from the secretary of the State Board of Health of Massachusetts, from Hon. C. D. Wright, chief of the Massachusetts Bureau of Statistics of Labor, from Sidney Andrews, Esq., secretary of the Massachusetts Board of State Charities, from Edward Jarvis, M. D., and from Col. Emmons Clark, secretary of the Board of Health of the city of New York. These donations embrace the following volumes, with a few duplicates, not here enumerated.

Reports of the Registrar General of England, vols. 21 to 29 inclusive; 4th Report of the London Local Government Board; Report of the 4th National Sanitary Convention; Sanitary and Medical Reports of the United States Navy for the years 1873 and 1874; Massachusetts Registration Report, vols. 17 to 32 inclusive; Census of Massachusetts for 1875, in 3 volumes: Census System of Massachusetts; Report on Statistics of Labor for the years 1870 to 1876 inclusive; The History of the Bureau of Statistics of Labor; Public Charities of Massachusetts; Reports of the Massachusetts Board of Charities, vols. 3 to 13 inclusive; Report of the New York Board of Health for the years 1870 and 1871, and from H. I. Bowditch, M. D., one volume of Monographs from the pen of the donor, and the Report of the Massachusetts Commissioners, of a General Plan for the Promotion of Public and Personal Health.

There have also been donated to the library the following volumes:

The Legislative Manual for 1877, and the Report of the Secretary of the State of Wisconsin for 1877, from Hon. Peter Doyle; the Report of the State Board of Charities, from the Secretary, T. W. Haight, Esq.; the Transactions of the Wisconsin Academy of Sciences, 3 volumes, from the Secretary, J. E. Davies, M. D.; the Report of the Superintendent of Public Instruction, from Hon. E. Searing; the Report of the School Board of Milwaukee for 1876, from J. MacAlister, Esq.; the 4th Report of the Michigan State Board of Health; the 2d Report of the Georgia State Board of Health; the 5th Report of the Minnesota State Board of Health, and the 1st Report of the Colorado State Board of Health, from the Secretaries of these several Boards; the 5th Report of the Board of Health of the District of Columbia, from D. W. Bliss, M. D., Registrar; 10th Report of the Milwaukee Board of Health, from James Johnson, M. D.; the Health Officer's Report of Philadelphia,

for 1873, 1875 and 1876, and the Report of the Philadelphia Board of Health for 1875, from John E. Addicks, M. D., Health Officer; the 4th Annual Report of the Board of Health of Boston, the Digest of Statutes and Ordinances Relating to the Public Health of Boston, and the 34th Massachusetts Registration Report, from the Board of Health of Boston; the 21st Annual Report of Births, Marriages and Deaths of Providence, and the 23d Rhode Island Registration Report, from E. M. Snow, M. D.; 9th Annual Report of the Cincinnati Board of Health, from J. J. Quinn, M. D., Health Officer; the Report of the Mayor of Savannah, including the Health Officer's Report for the years 1873-4-5-6, and the 10th Annual Report of the Public Schools of Savannah, from E. A. Silva, Esq., Clerk of the Council; the Annual Reports of the Toledo Board of Health for 1875 and 1876, from A. W. Fisher, M. D.; the 9th Annual Report of the St. Louis Board of Health, from W. L. Barrett, M. D., Health Officer; 2d and 3d Annual Reports of the City Physician, Knoxville, from A. B. Tadlock, M. D.; the Reports of the Board of Health of Chicago for 1874 and 1875, and Rules of the Board of Health of Chicago, from the Health Officer; the Report of the Board of Health of Baltimore for 1876, from James A. Stewart, M. D.; the 4th Report of the Board of Health of New Haven, from C. A. Lindsay, M. D.; 2d and 3d Reports of the Board of Health of Mobile, from T. S. Scales, M. D.; 4th Report of the Board of Health of Reading, Pa., from W. Murray Weidman, M. D.; 10th Report of the Board of Health of Dayton, O., from T. L. Neal, M. D.; Report of the Board of Health of Elmira, N. Y., for 1875, from J. K. Stanchfield, M. D.; the 7th Annual Report of the Board of Health of Selma, Ala., from W. P. Reese, M. D.; the Annual Report of the Board of Health of San Francisco for 1876, from J. L. Meares, M. D.; the Annual Report of the Board of Health of Concord, N. H., for 1876, and Transactions N. H. Medical Society, 1877, from G. P. Conn, M. D.; the Annual Report of the City Officers, Patterson, N. J., for 1876, from J. C. Amiraux, M. D ; the 6th Annual Report of the City Registrar, Albany, from A. D. Lansing, Registrar; Health Ordinances of Cleveland, from the Health Officer; Disinfection in Yellow Fever, from C. B. White, M. D.; the Report of Marriages, Births and Deaths of Richmond for 1876, from J. G. Caball, M. D.; Report of the Sanitary Commission of Atlanta for 1876, from V. H. Taliaferro, M. D.; the 8th Annual Report of the Massachusetts State Board of Health, from C. F. Folsom, M. D., Secretary; the Transactions of the Wisconsin Agricultural Society for the years 1869 to 1877 inclusive, from the Secretary; the Transactions of the Medical Society of California for 1876-7, from J. F. Montgomery, Secretary; 1 set, complete, of the Reports of the Northern Hospital for the Insane, from the Superintendent; 1 set nearly complete of the Reports of State Hospital for the Insane, from the Superintendent; Reports of the Secretary of War, volume 4, 1875, and volume 4, 1876, containing Reports of the Chief Signal Officer, from the Secretary of War; the Report of the Connecticut Board of Agriculture for 1875, from T. S. Gold, Esq., Secretary; 1st Biennial Report of the State

Board of Health of Maryland, and Report on the Public Charities of the same State, from C. W. Chancellor, M. D., Secretary; 4th Biennial Report of the California State Board of Health, from F. W. Hatch, M. D., Secretary; and the Transactions of the Wisconsin State Medical Society for 1877, from the Secretary.

This office is also regularly receiving the weekly and monthly reports of the Boards of Health of various cities.

The following books have been purchased for the library during the year:

Volume 3, and subscription for volume 4 of Public Health Papers; Walling's Atlas of the State of Wisconsin; Heredity, by T. Ribot; Village Improvements, by G. E. Waring; Nurse and Patient, and Camp Cure, by S. W. Mitchell, M. D.; The Detection of Criminal Abortion, by E. Van de Warker, M. D.; The Jukes, by R. L. Dugdale; Lectures on State Medicine, by F. S. B. F. de Chaumont, M. D.; On Personal Care of Health, by E. A. Parkes, M. D.; Water, Air and Disinfectants, by W. N. Hartley; 2 volumes Popular Science Monthly, and 1 volume Popular Science Supplement; Sex in Education, and The Building of a Brain, by E. H. Clarke, M. D.; Illustrated Homes, by E. C. Gardner; Mothers and Daughters, by T. S. Verdi, A. M., M. D.; Sanitary Engineering, by Baldwin Latham; Nutrition in Health and Disease, by J. H. Bennett, M. D.; Sanitary Engineering, by J. Bailey Denton, M. D.; Public Health, by E. A. Parkes, M. D.; Health in the House, by C. M. Buckton; also, subscriptions to the Sanitarian, the Sanitary Journal of Scotland, and the Public Health Journal of London.

EXPENSES.

The following is a summary of the expenses of the board during the year, as shown by the vouchers which have received your approval, numbered from 38 to 95 inclusive, and upon file in this office:

Official expenses of members	$327 52
Postage	178 22
Paper, stationery and electrotype	61 49
Printing and binding	415 55
Books and instruments	164 80
Chemicals and chemical analyses	35 75
Office furniture	25 50
Secretary	1,500 00
Miscellaneous (freight, express, etc.)	39 53
	$2,748 36

From this amount there should be deducted the sum of $382.18,

the same being for the cost of printing and distributing 3,000 extra copies of the first annual report of the board, an expense properly belonging to the year 1876, leaving the actual expenses of the year 1877 at $2,366.18.

Very respectfully, J. T. REEVE, M. D.,
Secretary.

SCARLET FEVER;

ITS NATURE AND MEANS OF PREVENTION.

BY E. L. GRIFFIN, M. D., OF FOND DU LAC.
President of The State Board of Health.

A recent writer remarks, "that if science can point out practical conditions by which great maladies may be averted, society is, in the highest degree not only unwise, but blameworthy, if these conditions are not realized."

With propriety this responsibility may be thoughtfully considered in relation to scarlet fever, which has come to be one of the most destructive agents of human life on this continent. While with reference to yellow fever, cholera and small pox, the profession and the public may have been fully alive as to the necessity of prevention and limitation, it is equally true that scarlet fever has not commanded such general and well directed efforts for its limitation as its prominence, as a preventable disease, demands. This fact may be accounted for, in part, when we consider the lack of well defined views concerning its nature, and the laws that govern its spread.

There is no disease that causes greater anxiety and suffering. It penetrates the private dwelling and the public institution. It is in the city, the village, and the remotest country home; in the cottage of the poor and the mansion of the rich, gathering its fearful harvest of young life.

It is within the province of boards of health, both local and state, to instruct the people, so far as they can, in the use of such measures as give promise that the disease may be greatly curtailed, and many of its fearful ravages averted. Hence it becomes desirable that all parties, and especially those who are entrusted with the

personal care of those sick with the disease, should be able to recognize its early invasion and know best how to neutralize its contagious element, both for their own protection and that of those who may be exposed.

HISTORY.

Scarlet fever is a disease of Asiatic origin. The first authentic history to be found of it was given in 1550. In 1565 it was epidemic in Paris. In 1580 it appeared in Spain, and in 1680 in Italy. It the latter part of the 17th century it prevailed as an epidemic in London. It is comparatively a new disease in the United States. So rare was the disease, that Dr. Benjamin Rush is said to have remarked sixty years ago that a physician would not be likely to see it more than once in his life time. The first authentic record of scarlet fever in this country is an account of an epidemic in Kingston, Massachusetts, 1737, by Dr. Douglass. From this place it spread slowly but with great fatality throughout the New England Colonies.

In some localities in this country it receives but little attention even at the present day. In the mild and genial climate of the gulf states it generally appears in its benign form, and we are informed that until quite a recent date, it was not recognized upon the Pacific slope. There are yet some localities where it is unknown. It has never been recognized in Japan, and is not much known throughout India.

ITS FATALITY.

It ranks among the most fatal of diseases. In Boston the deaths from scarlet fever for the ten years preceding 1820, were only 30. For the ten years preceding 1849, there were 1,468. For the year 1876, 642. The whole number of deaths from this cause in the state of Massachusetts for twenty years ending with 1875, was 23,829.

The deaths from this cause in Wisconsin, according to the last census, for the ten years ending June 1, 1870, were 1,016, and it is quite likely that the number largely exceeded these figures.

Owing to the very incomplete mortuary returns by the physicians of this state, no accurate statement can be given of the number of deaths during the past year from this one cause, but reliable returns from a few townships and cities show a large aggregate mortality.

In New York city there were only 67 deaths from scarlet fever during the ten years preceding 1828, while during the four years preceding 1870, there were 5,271, and the mortality from this cause has been very large during the consecutive years up to the present time.

In Chicago, scarlet fever is credited with 1,177 deaths during the twelve months ending August 1, 1877. Milwaukee, for the same time, reports 205 deaths from the same cause. Nor is this fearful mortality confined to the large cities and populous towns. In Wisconsin, many inland villages and rural districts have been the theater of an extensive and very fatal form of this disease during the past year.

These facts in the history of scarlet fever are introduced to show the manifestly increasing aggregate mortality from this cause, with the hope that the attention of all parties may be directed to the duty and the necessity of observing such methods and means as may give promise of checking its spread wherever and whenever it may manifest itself.

Vital statisticians have come to regard scarlet fever as the most *constant* epidemic which afflicts the community. A moment's reflection upon the great army of little ones that annually melt away before this pestilence ought to awaken the deepest solicitude on the part of all, and commend to universal approval and hearty support all measures looking towards the limitation of this great evil. It is certainly our duty to search out, by every possible means, the causes, however deeply hidden they may be, which contribute to the spread and fatality of this disease, and to devise means whereby it may be rendered less prevalent and fatal.

NATURE OF THE DISEASE.

Scarlet fever is a highly contagious and infectious disease of the zymotic class, and may be acquired through contact with the skin, through emanations from the lungs, from the excretions of the body, and through the exfoliations of the skin which are characteristic of this disease. Usually, in some part of its course, it is accompanied with a scarlet blush or rash, and is generally attended with sore throat, frequently mild, often very severe.

As a disease, it is in essence one, having one common nature and origin, wherever it occurs and whatever its type. Whether it be

called scarlet fever, scarletina, scarlet rash, canker rash or malignant sore throat, its nature is always the same. The difference consists only in degree of mildness or severity. The worst forms may be contracted from the mildest and the mildest from the most malignant. The same alarming complications are liable to accompany and to follow any variety of the disease. These are fearful to contemplate. Some of them disfigure for life; some permanently weaken or destroy important organs; some bring a speedy death; some a miserable existence worse than death. Inflammation of the eyes may occur, seriously impairing vision or leading to total loss of sight. Inflammation of the structure of the ear, followed by destructive ulceration and partial or total loss of hearing. The salivary glands may become inflamed, leading to large sloughs of the tissues in the neck, generally destroying life. Inflammation of the lungs and of the kidneys are frequent, the latter often resulting in general dropsy. Gangrene of the throat, the mouth, the nates and large portions of the skin may occur, producing deformity or speedy death. A large number of organic diseases may follow, such as disease of the heart, and the liver, bronchitis, pleurisy, consumption, diphtheria, diarrhœa, rheumatism and hectic fever.

These are some of the perils to which scarlatinous patients are exposed. No other disease so prostrates the system or lays it open to so many ailments. Fearful as is the great mortality from the primary attacks of this disease, the aggregate loss to human health and life from its sequelæ is more than a duplicate. In its peril to human health and life, it is more to be dreaded than small-pox, and should be guarded against with the most unremitting diligence.

DEATH RATE.

Ordinarily, in mild cases, nearly all will recover, provided they are not injudiciously interfered with, and are allowed tolerably favorable hygienic surroundings. Those epidemics in which the death rate is below ten per cent. may be regarded as mild, but the majority of epidemics are severe, and have a much larger mortality. Frequently the death rate runs up to 13, 18, 20 and even 25 per cent. In some it has reached as high as 40 per cent. The mortality is almost wholly among children. Nearly two-thirds of the deaths from this disease are among children under five; almost nine-tenths among those under ten, and more than 95 per cent. of

the total mortality are under fifteen years of age. Such a foe to young life should arouse our gravest apprehensions, and lead us to environ our households with the strongest possible safeguards.

Experience has demonstrated that, in regard to seasons, spring and summer are nearly alike in the liability to the disease, although the number of cases increases slightly in summer, and attain the maximum in autumn. A temperature varying from zero to 65° influences but slightly the scarlatinous tendency, while this tendency is decidedly modified by a temperature of 75° to 80°, and is quite destroyed by a prolonged high temperature varying from 80° to 85°, hence it is more fatal during the cold months of the season. Dampness promotes fatality even more than a low temperature.

HOW IT IS CAUSED.

The latest investigations prove quite conclusively that the prime cause of scarlet fever is an infective material which may be absorbed into the system by inhalation, by inoculation and by foods.

As to the essential nature of this material, we know but little. It is not gaseous; is extremely tenacious of vitality; its viability is not disturbed by freezing, and it exhibits greater activity during cold weather than in warm. It is not destroyed by ordinary disinfectants. Its destructive agent is heat. Its activity may, however, be impaired by great atmospheric dilution. It floats in the atmosphere, although its area of influence is quite limited.

There are two classes of causes that have been claimed for this disease. The one is the chemical theory ascribing it to zymotic action or ferment; the other is of a vital nature due to the generation of living organisms. The vital theory of the infectious principle is held at the present day by a majority of investigators. German pathologists have found *bacteria* in the blood, and conclude that the poisonous principle may float in the air in the form of spornles.

Beal says of them, "That they may transport themselves from place to place; they may insinuate themselves through the narrowest aperture or creep through very minute fissures and channels; they may climb through water, and there is every reason to think they may move upward through perfectly still air by virtue of their capacity for vital movement."

"This inherent power being recognized, and the minute proportion of the disease germ being borne in mind, as well as its capa-

city for infinite and swift multiplication, it is very easy to see how diseases dependent upon the induction of a vital contagium may be carried into the circulation of a previously healthy or predisposed organism."

The conclusion has not, however, been reached as to the role played by *bacteria* in the production of infectious diseases. It may be that they are not the *causative* agent of these maladies, but, as Hiller has suggested, a frequent accompaniment of sceptic action, and may act as the carriers of the contagium. They may be the *abode* of the poison and not the poison itself.

It remains for further investigations, based upon clinical observation, to fully determine the essential nature of the scarlatinal poison. How and when it first originated is not known, but all outbreaks of the disease since the time it was first recognized have been traceable to the conveyment of scarlatinous infection, whether these outbreaks occurred in localities where it never before existed, or in fresh epidemics where it had previously appeared. It is quite certain that it does not originate and develop in the human organism, but in matter outside, as with cholera, typhus, typhoid, intermittent fevers and small pox, and is absorbed *into* the system and poisons it.

"It may appear," says Dr. Smart, "a useless and unnecessary matter to prove the contagious character of scarlatina poison, although I know that many physicians hold opposite views regarding it; views which can but be highly pernicious in practice. A question of importance is, Does the disease ever occur except as the result of contagion? Does it ever arise sporadically? There is no more evidence for such a belief than exists for the theory that any other member of the exanthematous group may thus originate. No one makes the assertion that variola, rubeola or varicella may thus originate."

The following propositions may be considered:

1st. Wherever the contagious element has never obtained ingress, there scarlet fever is unknown.

2d. As a rule, the newly affected patient produces a contagious material identical with that which prostrated him, and is just as capable of infecting others as he was himself capable of being affected by the original contagion.

3d. Direct inoculation with the serum, the blood and the scales that are thrown off from the skin, produces the disease in others.

4th. Careful exclusion is found to entirely prevent the spread of the disease, and free exposure to increase and diffuse it.

Each of these propositions may be abundantly verified. All apparent contradictions may be reconciled by the fact that some are very susceptible to the contagion, some are affected indifferently, and others not at all.

If authorities were needed upon the totally infectious nature of scarlet fever, we might mention Dunglison, Watson, Wood, Niemeyer, Flint, Trousseau, Aitken, Reynolds, Turner, Smith, Meigs and Pepper, Condie, Thomas and Thompson, all of whom are as positive on this point as they are concerning the infection of yellow or malarial fever.

WAYS IN WHICH THE DISEASE IS SPREAD.

1. By a strong susceptibility to the infection which exists in certain persons, who will, upon the least possible exposure, contract the disease. In what this susceptibility consists, no one has yet found out. Doubtless it is dependent upon some peculiar physiological conditions. It is not dependent altogether on either a weak or a vigorous state of the body, for the strong and healthy often succumb to its slightest influence, while the delicately constituted may remain unaffected under great exposure. Generally, however, an exhausted condition among either the strong or the weak, seems to make them more susceptible to the poison. This susceptibility varies, also, in the same person, rendering the party insusceptible at one time and open to an attack at another. Some families seem, also, to have a remarkable aptitude to receive the scarlatinal poison. This is evinced by the unusually short period of incubation, the rapidity with which one after another in the same family come down with the disease, and its great virulence and fatality. Such indications should excite the gravest apprehensions and prompt to the utmost vigilance in guarding the well, and separating them from the sick.

2. False notions about the stage of the disease or the time when it may be conveyed from the sick to a second party.

It cannot be too strongly reiterated that a scarlatinous person may communicate the poison at any time, whether at the commencement or during the bloom of the eruption, or during the time of desquamation. Persons in large numbers have been known to

contract the disease before any eruption appeared. In many instances the disease need not have spread from the first house where it appeared, had visitors been excluded during the early as well as the later stages of the disease.

3. The premature liberation of the patients from the home is a very fruitful method of extending the contagion. Here lies a great public evil. Long before the period of exfoliation is completed, and even in the midst of it, many patients are allowed free access to the play ground, the school, the church, and the public hall, and these all become foci of the infection. Pupils are often sent to the public schools when members of the same family, and in the same house are prostrate with the disease.

Children do thus, in many instances, contract the disease from those from whose homes they have been vigilantly excluded through fear of the same. It is quite well established that the power of the patient to infect, by emanations from his person, continues for a period of from four to six weeks after being first taken sick. In some this power continues much longer, if the patient has not been thoroughly cleansed, and may be continued almost indefinitely unless his clothes have been well disinfected.

4. Fatigue may be mentioned as a factor, which contributes to the spread of the disease. All contagious disorders are more likely to sieze hold of weary and exhausted bodies than those that are fresh and vigorous.

5. The habit of visiting, by those who are well, in houses where persons are ill with scarlet fever, is another fruitful method by which to disseminate the disease. Many do this through sympathy and the kindest of motives. Feeling safe themselves, they have no thought they are to be carriers of death to their own households, and afterwards wonder at the seemingly harsh dealings of providence, when the shadow rests upon them.

The carriers of this contagion may be said to be legion. It is not thought that the atmosphere, directly, conveys the disease far from the room in which the sick are confined; but infectious particles may settle upon any articles of furniture, or clothing or bedding, on tables, bureaus, pictures, musical instruments, carpets, wall paper, and by them may be disseminated from house to house. They may settle on the clothing of callers as well as upon those of the nurse. Dr. Lewis Smith states that one of his patients, an in-

fant, had scarlet fever communicated to her by a washerwoman, whose own child had the disease, and who, on reaching the house where she had been engaged to work, threw her shawl over the cradle where the child lay sleeping.

Men of the highest authority have giver records of cases where the disease has been communicated by articles of furniture; by locks of hair taken from the dead; by letters written and sent to distant parts from the house in which were cases of scarlet fever.

Articles of food may convey this poison.

Drs. Bell and Taylor have traced unmistakably the origin of it to milk sold by a farmer, where the housewife went from the sick room of her child, prostrate with scarlet fever, to the barn to milk. It is supposed that the poisonous particles fell from her hands in the act of milking, she not having previously washed them. They further prove the communication of the disease by milk used by a healthy child which had stood in a room for some time where a scarlet fever patient was being nursed. If these facts exist, it is rendered possible that other kinds of food may be made carriers of the poison, where carelessly handled.

Local peculiarities, also, no doubt, contribute much to spread the scarlatinous contagion. The water, the soil, the subsoil, the imperfect drainage of poor land, the defective sewers of cities, defective ventilation of rooms, foul odors from cesspools and water-closets, where animal matters are decaying; a certain kind of *crowd poison*, similar to that which engendered typhus fever, may all add largely to induce susceptibilities to the scarlatinous poison, and to render its working more virulent.

The locality in which we live; the houses in which we live; the mode in which we live, are all factors to be carefully considered in order to obtain a correct guide for the sanitary regulations that are requisite for staying the progress of infection. It is obvious that there is something in local surroundings that either modifies or aggravates scarlatinous epidemics.

"Taking the experience of cities and villages, the contagious virulence and epidemic ravages of this foe of childhood will be found in greatest force where local moisture and impurities about the dwellings and neighborhood are greatest; in other words, where general unhygienic conditions prevail." *

* Harris, Dr. E.

It is not always the poor who suffer most, for in many houses where affluence exists, foul gases from furnaces, water closets and defective drainage pipes so unconsciously vitiate the air as to reduce greatly the normal vitality of the inmates.

The type of an epidemic is sometimes more severe and the mortality greater in the country than in the city, owing, perhaps, to the peculiar condition of the soil or to the unhealthy condition of the farm houses, which are often cursed with poor cellars and suffocatingly small and poorly ventilated sleeping rooms.

In Lansing, Michigan, during the epidemic of 1875–6, the disease was most severe and fatal in a section of the city which was originally, in great part, marsh lands, and was defectively drained. There is abundant evidence to show that it takes on more virulence and is more fatal amid those unsanitary conditions which have a tendency to lower the system and produce an unhealthy condition of the body.

PECULIARITIES OF SCARLATINOUS POISON.

1. It changes the character of the blood. This is corroborated by clinical facts, while all the premonitory symptoms indicate malnutrition of the nervous system.

2. This toxic material, carried about by the blood into every part of the system, has a special affinity for the tissues of the skin, and the throat and these tissues are mainly operative in its elimination.

3. This poisonous element is a solid substance, and is exceedingly tenacious of vitality, retaining its infecting power for a long time. Very numerous instances are on record, where the poison has remained lodged in unoccupied houses for weeks, months, and even years, and then has proved active. Dr. Smart, of Michigan, gives the history of a case that came under his observation, where a garment worn by a sick patient communicated the disease one and a half years afterwards, although it had been thoroughly aired.

Richardson relates of a family in which there were four children, who resided in a thatched cottage in the country. One child was taken sick and died of scarlet fever. As soon as the disease appeared, the other children were removed and escaped the sickness at that time. The house was then cleansed, whitewashed and well ventilated, and the clothing of the patient destroyed. After a few weeks, another child was taken back; and in twenty-four hours it

exhibited signs of the disease, and died in a few days. Again the house was thoroughly cleansed and ventilated, and remained vacant for four months, when a third child was returned, only to be sacrificed upon the same altar. After a careful search, the opinion was reached that the poisonous particles must have lodged in the thatched roof under which the children slept.

Hildebrand's coat was found to retain the poison for a year and a half.

Elliotson of St. Thomas hospital states that the wards of that hospital where scarlet fever patients had been nursed were for two years capable of conveying the disease. Dr. S. Parry, of Doyleston, Pa., reports, April 1877, a case of death from scarlatina communicated by means of a ball of woolen yarn, which had been laid away in a bureau undisturbed for four years. The first child of the family had died from this fever. After the birth of the third child the mother while confined to bed bethought of some way to occupy herself. Calling for the ball of yarn, she commenced knitting, the new born one lying by her side. In a few days this child exhibited well marked signs of the fever and in a short time died, although no case of the disease had been known for a long time in that vicinity.

4. There seems to be scarcely any limit to the time when the contagious substance, if not destroyed by disinfection, may not give rise to new cases. Woolen fabrics retain the poison longer than any other material, probably on account of their peculiar structure. The hair also is a rare hiding place for it and when fashion adds the switch or the roll the head is converted into a fruitful garden-spot for the lodgment and development of the disease.

5. This tenactity of existence in the contagious element is not destroyed by *mild* solutions of disinfectants. Really to disinfect, the solution must be very strong.

Dr. F. A. Mahomet, in the Sanitarian for February, 1876, writes, that a child was returned to her home after a seven weeks residence in a hospital, while sick with scarlet fever. Desquamation seemed to be thoroughly complete. She had numerous carbolic baths. She was not allowed to take a single article of clothing which she had worn while at the hospital. During her absence, her twin sister had been free from every form of disease, but two days after her return, the little one who had remained at home, exhibited premoni-

tory symptons of the disease, and shortly had all the marks of a sharp attack of scarlet fever.

6. The germinating period of the poison, varies with the state of the patient in whom it finds lodgment. In some, the period is no longer than a day. In some, two or three days. In others, many days. Ramsbotham, with other authorities, states that scarlet fever poison may lie dormant in the system for a number of weeks, and then break out with fearful severity. Thus there seems no absolute warrant for security even where the disease does not appear within the usual period.

7. Only a very brief period of exposure is required to become affected. A very brief stay in the sick room may be sufficient to cause the lodgment of the poisonous particles in the clothing.

8. The infective particle is not destroyed by cold weather. Ventilating the infected articles in a freezing atmosphere is not sufficient to destroy it. Thoresen, by numerous experiments, has proved that even intense cold does not destroy it.

9. Heat, on the other hand, will destroy it. Hildebrand, Henry and Behrend have each separately demonstrated that heat raised to a boiling point utterly destroys the virus. Only this, and strong solutions of well known disinfectants like carbolic acid, chlorine, and sulphurous acid gas possess this ability.

PROPHYLACTIC MANAGEMENT.

Up to the present time no drug has been found that will prevent one from contracting the disease. There are drugs which have claimed the confidence of some as being able to prevent or greatly to modify the course of the disease. Belladonna for a time, by a few, was supposed to be a sure prophylactic, and occupied the most prominent place in the category of preventive drugs, but experimentation by large numbers of medical men has over and over again proved it valueless. Many have taken it faithfully and yet have fallen victims to the disease.

The same want of confidence is felt in that more recent candidate for public confidence, the sulpho-carbolate of soda. Like Belladonna, after the most faithful and varied experimentation, in the hands of experienced and careful men, it has failed to avert an attack of the disease. In Chicago, during the past winter, many physicians used this drug in every variety of mode and dose, and yet

it failed to command confidence or establish its claim as a prophylactic.

Neither have efforts made to protect the system by inoculation proved a success.

It is greatly to be desired that this end may yet be attained, and that, as in the case of small-pox, some innocuous process may be discovered by which this scourge of the youth of our land may be ameliorated if not entirely eliminated. Such a discovery would mark the century in which it was made and render immortal the name of him who should confer such a boon upon humanity. Until this shall happen, we are shut up to the use of other instrumentalities for preventing its spread, pre-eminent among which are the following:

ISOLATION.

1. Put the patient in a condition of *absolute and perfect quarantine.*

No prophylactic measure is of so much value as complete isolation. This measure also implies the exclusion of all, excepting those who are absolutely necessary for the faithful nursing of the patients.

It indicates the prohibition of all visitors to rooms and houses where such patients are confined. The patient should be placed in an upper room if possible. The largest possible ventilation should be given consistent with the judicious protection of the sick one. Such a seclusion may at times seem unnecessary; but we have to bear in mind the possible results from the neglect of it. A kind neighbor making a brief visit may bear away the disease germ and spread this terrible disease throughout the neighborhood. The mildest cases may be followed by those of greatest intensity and malignancy, by reason of bad surroundings or unusual predisposition.

This seclusion of the patient should extend over a period of from four to six weeks.

2. The careful removal from the room which the sick one is to occupy of all needless articles, such as carpets, bureaus, pictures, musical instruments, books, and whatever else may gather and retain dust, or serve as possible hiding places for the poison.

Great regard should be had to cleanliness, both of the patient,

the attendants, the apartment, and of all clothing and utensils used in the room.

Food taken to the sick room should not be partaken of by any one excepting the sick one.

The minute particles which fly off from the patient during the period of desquamation must be imprisoned until they can be disinfected. This can be done by anointing the surface of the body, the scalp included, twice or more daily with carbolized or camphorated oil, cold cream or common lard. Handkerchiefs should be excluded, and cloths that may be speedily burned substituted for wiping away the discharges from the throat and nose.

The wearing apparel of the nurse and attendants should be of such material as can be easily washed, and as free as possible from tucks and folds, which serve as hiding places for the infecting material.

The several patients in the same family, so far as possible, should occupy different rooms, through fear that the poison might be aggravated and the type of the disease intensified.

3. The burying of all discharges from the body, and the disinfecting of all expectoration and nasal discharges.

The utensils used in the sick room should be kept constantly disinfected, while such articles as are of slight value, together with the sweepings of the room, should be burned. Such articles of clothes as cannot be baked or boiled had better be burned. A disinfecting sheet may be useful before the door or in the hall.

Some strong disinfecting fluid should always be kept in the sick room for the various occasions which may arise with reference to the discharges and utensils of the sick, and for the hands of the attendants.

4. The bathing and changing of clothes of physicians, nurses and clergymen who attend the sick, before visiting at any other house, and the exclusion from the public schools of all members of the family during the continuance of the disease in that family.

5. The compulsory report of the attending physician to the health officer of the town of all cases of scarlet fever, within twenty-four hours after learning of the existence of such disease, in any and every case under his care, and said health officer should see that the best sanitary regulations, in all cases, are enforced.

6. The occupants of all houses where scarlet fever exists, should

kindly prohibit the entrance of all persons, excepting necessary attendants, until the disease is past and the premises disinfected.

7. The thorough cleansing and disinfecting of the patient's body and clothing before being again allowed access to the public. This is effected by warm baths, with the free use of soap, taken on three or four successive days, until all roughness of the skin disappears. After this process, and with clean clothes, he may be deemed again safe for association. However slight may have been the attack, until this precaution has been observed, he must be regarded as unsafe to persons susceptible of scarlet fever.

8. The thorough cleansing, disinfecting and fumigating of all rooms and houses in which the disease has occurred, after the last case has been cured or buried.

9. The dead should be interred as soon as practicable. All funeral services should be conducted in a private manner, and never in a church. The attendants should be only the inmates of the family, and under no condition should there be any exhibition or exposure of the remains. Common customs and personal wishes must be subordinated to considerations of public safety. It is always to be remembered that the separation of the disease from the well is the most certain means of preventing its spread. Instances are numerous where infectious diseases have been spread through the exposure attendant upon public funerals.

Dr. Kirby Kitloe, of Grant county, Wisconsin, relates the case of a man who, against his most earnest protest, attended the funeral of a child in the family of a relative, sixteen miles distant, and brought the disease home to his own family, which proved fatal in the case of a favorite child.

"Dr. Goldie, the medical officer of health for Leeds, England, in his report to the local authority, states that every one of thirty people who attended the wake of an Irish girl who recently died in that town from typhus fever, were attacked by the same disease, and no fewer than *nine* of the cases ended fatally."

It is not too much to claim that if the foregoing precautions were observed, scarlet fever would scarcely pass beyond the bounds of the house where it first appeared. Certain it is that it would be robbed of much of its terror and kept effectually in abeyance.

Nor is it unlikely that under the more general diffusion of sanitary knowledge, and a better understanding of the laws of disease,

that the time may come when the common law, which guaranties protection to life as well as to property, will take cognizance of gross ignorance and great carelessness in regard to diseases dangerous to the public health, where such ignorance and carelessness jeopardize the health and life of the citizen.

The case recently noticed in an English medical journal, which, after two trials remains undisturbed, looks strongly in this direction. The case was one in which the owner of a lodging house brought an action against a gentleman who brought his children from London during convalescence from scarlet fever into the lodgings, without notifying the landlord of the danger to which his family were being exposed. Two of the children of the lodging house keeper took the fever and died. In the first trial the jury awarded substantial damage; this verdict was sustained upon a second trial. (Am. Jour. Obst., 1873, p. 71.)

Where instruction and admonition shall prove powerless against ignorance, negligence, willfulness and a deficient sense of duty, the citizen may justly claim the protection of the state from the possibility of a great calamity.

If from the facts we have grouped, and the suggestions made, it appears that the public health may be preserved, and many young lives saved from a needless sacrifice, we would respectfully recommend to the health officers of every township, incorporated village and city in the state, the adoption of the following rules, or a modification of them to suit local conditions, for the better protection of the people against scarlet fever:

1. That all physicians or persons acting as such, be required to report every case of scarlet fever that may come under their care, whether mild or severe, to the health officer of the town, within twenty-four hours after discovering its existence; and that in case no physician is in attendance, the parents or guardian of the patient shall be required to make such a report.

2. That the sick person shall be *isolated* as much as possible from the other inmates of the house. If circumstances will permit, he should be placed in an upper room, previously prepared by the removal of all superfluous curtains, carpets, woolen articles, unnecessary clothing, bedding or furniture, likely to retain the infection.

3. That visitors to the sick room, except in the case of clergymen and medical men, should be peremptorily forbidden. All in-

tercourse with the neighbors should be suspended excepting such as may be demanded by the necessities of the family and of the sick one.

4. Special attention should be directed to the house and its surroundings. Any accumulation of filth or refuse of any kind should be at once removed and disinfectants freely used.

5. That the ventilation of the sick room shall be made as complete and perfect as possible, under the direction of the attending physician. A current of air may be established safely through the window in the following manner: Raise the lower sash of the window three or four inches, then procure a piece of board made to fit accurately into the lower opening, and place it there. By these means free outward and inward currents of air, without causing any draughts — are obtained through the vacant space between the two sashes.

6. That where death from scarlet fever occurs, the body shall be wrapped in a clean sheet and placed in the coffin, being well sprinkled with some disinfecting fluid, such as strong carbolic solution, or dusted over with chloride of lime, and that it should be buried with the least possible delay. On no conditions should it remain in a room occupied by the living.

7. That during the existence of the disease, an adequate supply of disinfectants should be used; and if the family be too poor to obtain such, the Board of Health shall furnish them at the expense of the town.

8. That all houses where scarlatinous patients have been nursed shall be thoroughly cleansed; the ceilings and side walls of the sick room be lime washed, the wood work scrubbed with soap and water, and thorough ventilation allowed, after the patient last sick may have recovered or have been removed.

9. That no child having recovered from scarlet fever shall be admitted into the public school until six weeks after the day of first having been taken down with the disease; and that no child living in the same house shall attend the public school while the disease exists in that house. Nor even then, until such time as they furnish to the teacher of such school a written statement from the attending physician that the house and premises have been thoroughly disinfected, and that there is no longer any danger from contagion.

10. That patients dying of scarlet fever shall be buried in a private manner, as persons dying of small pox generally are.

Some of these recommendations may seem to be unnecessarily stringent, but when the welfare of the public and the great interests of human health and life are considered, we cannot recommend less.

Our duty to the living imperatively demands the enforcement of very stringent rules. We know of no other method of adequately dealing with this terrible destroyer of child life, and we believe that these methods, if faithfully adopted, will be followed by most happy results.

DISINFECTANTS,

AND THEIR SPECIAL APPLICATION.

BY E. L. GRIFFIN, M. D., OF FOND DU LAC.
President of the State Board of Health.

The object of disinfection is to prevent disease. It implies a knowledge of the nature of infectious matter, and of the effect which certain substances, called disinfectants, have upon that matter.

With regard to both of these points, our knowledge is not absolute. Some facts have been established, and from these certain conclusions of a general character have been reached, of great practical value.

It is known that certain diseases are the result of an infective poison; and it is also known that this infective poison has a close connection with the decomposition of animal and vegetable matter. As to the nature of this infective material, we cannot speak with so much confidence. There can be but little doubt, however, that infection and contagion consist essentially in the growth and multiplication of minute organisms having the nature of plants or animals. The various theories that have been advanced only go to show how difficult is the problem.

A knowledge of those measures by which a malignant and destructive disease may be averted, checked or limited, in a community, is of at least equal importance to that which aims merely at the cure of disease.

Experience has proved that it is possible, by certain chemical agencies, wholly to destroy or prevent the operation of the specific infection or contagion of any disease; but to do this it is necessary that proper rules should be observed in the use of such agencies.

It should not, however, be presumed that all agents used to disinfect are invariably preventives of disease, however useful they may be when properly applied.

Disinfecting agents have a two-fold application:

1. To destroy the noxious gases and volatile products of putrefactive decomposition of both animal and vegetable origin.

2. To attack and destroy the virus of disease—the disease germ.

The destruction of foul odors is a very essential and appreciable process, but it is often necessary to strike deeper and destroy the disease-producing matter itself.

Cleanliness, pure air, pure water, good food and warm clothing are great safeguards against infectious diseases. Artificial disinfectants cannot be made to supply the place of these essential conditions of personal aud public health.

Hence the first rules against infection are:

1. That no house refuse, filth, excremental matter or foul dirt, producing noxious gases, should be allowed to remain about inhabited premises.

2. That all occupied dwellings should have an abundant and uninterrupted supply of pure, fresh air.

3. That all water used for cooking and drinking shall come from uncontaminated sources.

Some diseases are capable of rapid increase and multiplication in filthy, foul and damp places, hence all unclean and damp places about dwellings, places of business and places of public gatherings should be cleansed and dried. Such precaution will give the surest protection against pestilential diseases.

Disinfection should be made with minute exactness at the very appearance of a contagious disease. It is one of the most efficient means at our disposal to check the progress of a scourge.

Cleanliness, dryness and ventilation can never be supplanted by disinfectants. It is quite probable that all contagia would sooner or later be removed under the influence of constantly moving currents of air. Artificial means are appropriately invoked to hasten processes which nature in her own time would accomplish.

Disinfectants are naturally divided into three classes:

1. *Those which chemically destroy or effectually restrain the contagious and infectious virus.*

The principal of these are *heat, nitrous acid gas, sulphurous acid*

gas, bromine, iodine, sulphate of iron, sulphute of zinc, chlorine and *ozone.*

2. *Agents that arrest chemical changes and check the fermentive process—anticeptics.*

These prevent action of all kinds and put matter in a condition of rest, in which no change can take place and, consequently, no noxious gases can be given off. They destroy the germs upon whose presence and development the process of putrefaction appears to depend. They embrace most of those enumerated in the first class, the most important of which are *nitrous and sulphurous acid gases; carbolic, cresylic and salicylic acids; chloride of zinc; chloride of iron; chloride of calcium; chloralum; bromo chloralum, and sulphate of iron.*

3. *Deodorants and absorbents — agents that destroy putrid exhalations and physically restrain noxious compounds.*

The principal of these agents are *dry earth, charcoal, quicklime and chlorine.*

The following methods of disinfecting and agents used are such as correspond with the latest experience of the best sanitarians. They are not complicated, but are simple, effectual, safe, and involve so small an expense as to allow of their use in their appropriate places by nearly all persons.

1. Fresh Stone Lime.

Application. To absorb moisture and putrid fluids.

How used. Pulverized and scattered over places to be dried. In damp rooms, it should be placed in pans in liberal quantities. Mixed with water, it is used to lime-wash walls and ceilings. It is useful when spread over heaps of fresh manure as a preservative.

2. Pulverized Charcoal.

Application. To absorb putrid gases.

How used. Mixed with an equal part of fresh lime it forms the "*calx powder*" of the shops.

Thus combined it can be spread liberally over heaps of putrescent matter. It can be strewn in alleys, gutters and moist places where foul gases are generated and disease-producing germs are likely to be found.

To deodorize a privy, which contains only solid matter, this mixture is very effective.

The carbon of bones (ivory black) presents a larger absorbing surface than wood charcoal, and reacts with more energy as an absorbent.

Porous bodies, particularly charcoal, absorb many times their volume of gas and odoriferous products. The action of charcoal upon putrid substances is that of an absorbent only. After the quantity applied to any mass has become saturated, it will allow the passage of fetid odors again to escape. Its harmless nature, the facility with which it can be obtained and used, justify its constant employment for the many purposes which hygienic necessities indicate. Dry earth, dry coal, ashes and gypsum may also be used to disinfect manure heaps, the urine of stables and privies, where the quantity required is large and the material should be cheap. They absorb the watery material, and in a measure suspend the process of putrefaction. When well, river, or cistern water becomes impure from the presence of organic matter, and acquires a slightly putrid or sulphurous odor, it should be rejected; but if necessity compels its use, it should be disinfected. The only agent suitable for this purpose is charcoal well pulverized. This should be placed in layers, between clean gravel or broken quartz, and the water filtered through it. It is necessary that the charcoal should be frequently renewed, for its efficiency depends upon its absorbing power, and it becomes inert when saturated. Such water may also be purified by *boiling*. When so treated it should be exposed for a time to air, before being used, that it may absorb oxygen and carbonic acid.

3. Chloride of Lime.

Application. To destroy putrid gases and check putrefaction.

How used. A solution of *chloride of lime* made by straining or decanting a gallon of water into which a pound of the lime has been dissolved is a good disinfectant fluid to use in washing the bodies of those who have died of small pox, cholera, scarlet fever, measles, or any other disease. It is a good solution to use in the sick room for cleansing the hands of the nurse, and into which small articles can be immersed which are awaiting an opportunity to be boiled.

To generate *chlorine gas*, pour strong vinegar or dilute sulphuric acid upon chloride of lime placed in pans in the room. Or, place in an earthen vessel four ounces of peroxide of manganese and pour upon it one pound of muriatic acid.

Chlorine gas is regarded as an efficient disinfectant, but it must be *efficiently applied*. It is very efficient in disinfecting confined or infected atmospheres and porous substances. Its rapid diffusion and power of penetration are great. It destroys sulphuretted hydrogen, ammonia, and all fetid organic compounds. Its odor penetrates far beyond its power as a disinfectant, hence its real degree of influence may be deceptive. It can appropriately be used in disinfecting ships, ship baggage, foul cellars and rooms unoccupied.

4. Dry Earth.

Application. To absorb effluvia from decaying animal and vegetable matter, and appropriately, human excreta.

Dry earth is nearly a complete disinfectant, if used in sufficient quantities to absorb all moisture. It is especially applicable to the deodorizing of privy contents, where the basin is shallow, with a limited quantity of fluid. It should be abundantly applied.

5. Sulphurous Acid Gas.

Application. To disinfect rooms and infected clothing. Applied only in case of unoccupied rooms. To be effectual in destroying disease germs, the fumes must be so strong that they would destroy human life.

Especially appropriate to be used in disinfecting rooms and clothing after cases of *small pox*, *scarlet fever*, *cholera and low forms of typhoid fever.*

Sulphurous acid has long been esteemed as a powerful disinfectant. It is to be preferred to *nitrous acid* or *chlorine gases*, because of the great irritation these latter produce upon the mucous membrane of the air passages when inhaled. These gases should only be used under the direction and advice of a competent physician or health officer.

How used. Place in an earthen vessel or iron kettle containing a small quantity of ashes, a few live coals upon which place from one to four pounds [illegible] in powder or fragments, according to the size of [illegible] containing 2000 cubic feet of

space would require about four pounds of sulphur, or one and one-half ounces to each 100 cubic feet of space.

To guard against accident by fire, it is well to place the vessel upon a flag or suspend it over a tub of water. As soon as the sulphur is ignited, the room, having previously been rendered tight, should be closed and remain closed for twelve or twenty-four hours. It should then be thoroughly ventilated by opening chimney drafts, windows and doors; after which it should be scrubbed, the ceilings lime-washed, and the walls repapered.

6. Nitrous Acid Fumes.

Application. Same as sulphur fumes.

It is one of the most powerful of all the gaseous disinfectants.

How used. By pouring over one ounce of copper chips or filings, placed in a deep jar, three ounces of concentrated nitric acid.

The fumes are rapidly generated and are so dangerous to life as to render this process of disinfection objectionable. It should never be practiced excepting as personally supervised by an intelligent physician or a competent and responsible health officer.

The oxidizing action of nitrous acid is very great on organic matter. It removes the smell of the *dissecting-room* sooner than any other gas.

7. Sulphate of Iron (Copperas).

Application. To disinfect privies, cess-pools, drains, sewers and all vessels and places receiving the discharges of the sick. It decomposes the sulphuretted hydrogen and the ammoniacal compounds so poisonous and offensive in privy vaults.

How used. Dissolve eight or ten pounds of the copperas in eight or ten gallons of water. Add to this solution one pint of the impure carbolic acid. The solution will be rendered more complete if hot water is used.

This solution can be freely used. A privy which accommodates an ordinary sized household will require, at least, one-half of this quantity every two or three weeks, during the hot summer months. A smaller quantity can be poured daily into the vault, also into water closets, waste pipes or sink drains.

Masses of filth in privies, sewers or drains should be thoroughly saturated with it, at brief intervals, until all offensive odors are gone.

A privy that receives the dejecta of persons sick with typhoid feve or cholera should be daily flooded with it.

Nitrate of lead, in the proportion of one pound to one gallon of water is also an excellent disinfectant to pour into sink pipes and water closets. It can be freely used.

8. Permanganate of Potassium.

Application. To disinfect temporarily soiled articles from the sick room until they can be boiled or washed.

It should not be used in connection with carbolic acid. This article forms the principal ingredient in "Condy's Disinfecting Liquid," of the shops.

It is an active oxidizing agent, and although less powerful than some, a good disinfectant and well adapted to the sick room as it has no disagareeable ordor.

Articles should be immediately boiled upon removal from this liquid.

The solution should be made by dissolving one ounce of the permanganate in three gallons of water.

This is an excellent disinfectant to use in purifying cistern water which has become offensive. For this purpose the solution may be stronger; when poured into the cistern the water should be stirred well from the bottom.

9. Chloralum and Bromo-Chloralum.

According to analysis of these compounds, the most valuable element they contain, and the one to which they owe largely their dlsinfecting property, is the *chloride of aluminum*, which of itself is a very efficient disinfectant.

The English chloralum, according to Mr. Walker's analysis, as given in the Sanitarian, contains:

Chloride of aluminum	20 ounces.
Sulphate of lime	1–3 ounces.
Water	131 ounces.

Bromo-chloralum contains:

Chloride of aluminum	13 ounces
Water, bromide of aluminum, and lime salts	143 ounces.

Showing the proportions of each compound very nearly the same.

The English chloralum has the authority of the best English sanitarians as a valuable disinfectant. Mr. Wanklin says of it: "For removing fœtor and effluvia, it is better and more available than any agent with which I am acquainted. In this respect it is incomparably superior to the chloride of lime."

How used. Dilute with eight or ten parts of water and place in vessels in the sick room, or saturate towels with the diluted solution and hang them in the sick room. It is well adapted to the sick room, as it possesses the advantage of being odorless.

10. Chloride of Zinc. Sulphide of Zinc. Sulphate of Zinc.

Application. These salts of zinc are used in solution precisely the same as the permanganate of potassium is used. They are all poisonous, but regarded as good disinfectants. The solution needs to be made strong — two ounces of the zinc to each gallon of water used. If the solution is very strong, damage may result to the clothing immersed in it. Articles immersed in these solutions should be boiled without much delay.

These solutions are especially adapted to the disinfecting of sewage.

11. Sulphate Zinc, Eight Ounces — (Crude) Carbolic Acid, One Ounce — Warm Water, Three Gallons.

This compound is well recommended by the Board of Health of the city of New York as a disinfectant. It is a convenient preparation to use in the sick room.

Soiled articles and clothing from the sick room can be temporarily soaked in it. A towel saturated with it may be suspended in the room. In case of infectious diseases a sheet may be wet with it and hung across the entrance hall. Articles to be disinfected can well be boiled in it, previously to being boiled in soap and water. It can be freely used in the sick room. The chamber and bed pan should always contain a quantity of this or similar fluid, to which more may be added whenever the vesels are used, so as thoroughly to cover the dejecta of the patient.

Nurses in attendance upon those sick with contagious or infectious diseases, will find it well to occasionally wash their hands in this fluid.

12. Iodine.

Application. For the deodorization and disinfection of fluid and semi-fluid substances undergoing decomposition, *iodine* is well recommended.

It is claimed to have a destructive influence over the virus of *small-pox* for which purpose it can be exposed, in small quantities, upon a plate in the room.

A solution of iodine, two grains; iodide of potassium, twenty grains, and water, four ounces, kept in an open vessel, at a high emperature, has been employed in t he sick room of *scarlet fever* atients as a useful disi nf ectant.

13. Carbolic Acid.

Application. Mixed in the proportion of one part of acid to from forty to one hundred parts of water, carbolic acid has a wide range of application as an antiseptic and disinfectant.

For purposes of thorough destruction of disease germs, a solution of not less than two per cent. of the acid should be employed. When used to disinfect clothing, a solution of one part of the acid to one hundred of water would be an appropriate strength.

To guard against damage to the clothing by the contact of particles of undissolved acid, a quantity of strong vinegar, equal to the amount of acid used, should be added to secure its complete solution in the water.

Carbolic acid may be added to the solution of sulphate of iron of sulphate of zinc to increase the disinfecting and antiseptic qualities of those solutions. Carbolic and cresylic acids (impure carbolic) are believed to be effectual agents in the destruction of every communicable virus of disease, and by their antiseptic property prevent those kinds of fermentation and decay which aid in propagating epidemics.

The preservative properties of these acids have long been known. The pitch which the Egyptians used in embalming contained them. The vapor of buring tar, which is so firmly fixed in the popular esteem as a disinfectant, owes whatever efficiency it has to the presence of these acids. Wood smoke derives its power as a preservative of meat, from the same source.

How used. In solution in water of varying strength, according

to the purposes to which it is to be applied. It is especially adapted to disinfect *sewage*, *foul grounds*, *drains*, *sinks*, *foul heaps of manure* or *garbage*, *stables*, *privies*, and the air of a foul place in which cholera or any pestilential disease exists.

Streets, court-yards and sewers may be quickly and thoroughly disinfected by this agent.

By mixing crude carbolic acid with saw dust or dry lime, it can effectively be used upon very filthy grounds or heaps of refuse.

Its efficiency in all cases will depend upon the thoroughness with which it is applied. It may be remarked that in the use of disinfectants generally, they are almost always used too sparingly.

Disinfection of a room, as is almost always practiced with a *spray* of carbolic acid, is a mere deceptive procedure. The quantity used is too small to produce any effect upon the specific contagion. It has been proved that *bacteria* and the *contagious particles* of *vaccine lymph*, when very slightly encased in any foreign matter resists the action of much stronger solutions than are generally used. If that be so, it may be presumed that the disease germ of small-pox, cholera, typhoid fever, or scarlet fever would do the same. Hence when relied upon for the destruction of disease germs the solution should be strong.

14. Ozone.

This substance exists normally in the atmosphere, and is believed to destroy the impurities of the air. It is an intensely oxidizing agent, and is regarded as a deodorant rather than a disinfectant. It is found everywhere in the air which rests upon the earth's surface. It exists in its maximum in the proportion of one part of ozone to 450,000 parts of air. It is believed to be generated by by the action of sunlight, resting upon a damp and oxidizable body in the presence of free oxygen. (Kedzie.)

It is nature's great deodorizing and purifying principle that oxidizes the emanations from decomposing animal and vegetable substances with which the air is constantly being contaminated, thus rendering them innocuous. The atmosphere would be so polluted by its admixture with the noxious matters evolved during the putrefactive changes which are unceasingly taking place on the globe, as to be unfitted for sustaining animal life, were it not for the all-pervading influence of the great disinfectant, ozone.

It has forty times the bleaching power of chlorine and is regarded as the most energetic constituent of the atmosphere. Compared with the normal constituents of the air it is an agent of amazing power. (Kedzic.)

While it is classed rather as a deodorant than a disinfectant, yet if present in a sufficient quantity, it is believed to destroy septic matter and morbific germs which float in the atmosphere.

Its use is especially indicated in all zymotic diseases in which the respiratory organs are not implicated. It is the effectual destroyer of those products of decomposition which are the habitat of the germs of contagious and epidemic diseases.

Ozone may be generated in the sick room by letting in the sunlight.

The popular, but correct notion, that sunlight bears an important relation to the healthfulness of the sick room rests upon the unrecognized fact that it generates ozone.

"A sunny room or the sunny side of the house is everywhere recognized as more healthful than a dark room or the shady side of the house. Dark chambers are the home of scrofula and anæmia."

Ozone may be artificially generated in the sick room by mixing equal parts of peroxide of manganese, permanganate of potassium and oxalic acid. Two spoonfuls of this powder, placed upon a plate in the room and moistened with water, will generate ozone but not in quantities sufficient to iritate the air passages or excite cough.

These ingredients should be separately pulverized and *mixed without friction*. As they form an explosive mixture if subjected to friction, this caution should always be observed.

15. Heat.

This may be applied as *dry air* or *boiling* or *heated-steam heat.*

Dry air. Hot dry air is the most powerful and complete disinfectant. It chemically disorganizes all noxious substances, and by producing thorough desiccation, prevents putreficative change. It also sets in motion atmospheric currents which mechanically dissipate morbific agents.

It has been proved that a temperature of 212° Fahr., destroys the virus of small-pox; one of 200° that of scarlet fever, and that vaccine virus being subject to a temperature of 140°, becomes speedily

inert. It may safely be inferred to have a like destructive influence upon other disease germs.

In the use of *dry heat*, two things are to be observed:

1. That the heat shall be equally distributed throughout the fabric so as to secure safety in all its parts.

2. That the temperature shall not be raised so high, or continued so long, as to destroy the fabric.

For house disinfection, including bedding, clothing, and woolen fabrics, dry heat is the most effectual means of which we have any knowledge. The degree of heat required to disinfect will not in the slightest degree damage the articles. A temperature of 240° or 250° F. is sufficient to destroy any contagia or disinfect any infected garment or fabric.

Heat penetrates much more easily when the fabric is dry.

To disinfect a horse hair pillow or a mattrass, a degree of 250° of heat should be used, and this should be continued for eight hours. This degree of heat can be applied to white woolen fabrics, linen, cotton, silk and paper, for two or three hours without danger. A longer time produces discoloration. An oven cautiously heated may be used to disinfect small articles.

Such articles or infected garments as will admit of being *boiled*, should be subjected to this process for at least two hours. This mode of disinfecting is simple, yet one of the best. Until such a process is commenced, all infected articles should remain immersed in some of the disinfecting fluids already mentioned.

For infected substances and garments that may be destroyed, *heat to destruction* should always be used.

16. Fresh Air, Pure Water, and Sunlight.

These are God's free gifts to all. These benign and conserving agents are always at command. They have no substitutes. Accompanied by an even temperature, they promise all that is needed, in most cases, in the sick room.

Note. — The foregoing recommendations have been gleaned from the annual report of the Board of Health of New York for 1873; "The Practitioner's Reference Book," by R. J. Dunglison; the valuable paper by R. W. Mansfield, and Prof. Kedzie's article on Ozone, in the Michigan State Board report, 1875.

HYDROPHOBIA.

BY SOLON MARKS, M. D., OF MILWAUKEE,
Member of the State Board of Health.

In the present state of our knowledge, Hydrophobia or Rabies must be regarded as an incurable disease, "no single, well authenticated case of recovery having yet been recorded," and it is not surprising that the appearance in our midst of a rabid animal should be the signal for general and wide spread alarm. Owing, however, to the fact that non-contagious, nervous diseases are often mistaken for genuine rabies, thereby creating much unnecessary alarm and anxiety, we have been induced to attempt the preparation of a paper, with the view of bringing together such facts as we can gather from our best writers on human and veterinary surgery regarding the symptoms of rabies in its different stages as they appear in the lower animals, especially the dog, hoping they may aid the non-professional in recognizing the premonitory symptoms, and also assist in distinguishing it from other nervous disorders which are comparatively harmless. We shall also endeavor to point out such preventive measures as may be of service to those beyond the reach of immediate surgical aid. Fortunately hydrophobia never appears in the human subject except as the result of contagion, "nor is there any evidence that it is ever communicated from one human being to another." Hydrophobia may occur both in the canine and feline species, and undoubtedly can be communicated to most warm blooded animals by inoculation.

The wolf, the fox, jackal, dog, and cat, are more liable to this disease than other animals, but we have most to fear from the domestic dog.

The cause of rabies, when originating *de novo*, is involved in

great obscurity, in fact little or nothing is known regarding it. It has been attributed to the influence of season, sudden change from heat to cold, eating of putrid food, long continued thirst, rage, confinement in impure air, want of couch grass, etc. Experience and observation have proven that the above enumerated causes in themselves are not sufficient to produce the disease, although they may, and undoubtedly do, act as predisposing causes in some instances.

The prevailing opinion seems to be that hydrophobia is more likely to occur in hot than in cold weather, and we find in most cities police regulations requiring dogs to be muzzled during the warm months of the year.

Observations, however, made at the large veterinary schools of Europe, prove this opinion to be erroneous. "Consequently, all police regulations intended to suppress or exterminate hydrophobia, which are enforced in the summer months and suspended at other times, fail of their object, and may even do harm, by inducing a fancied security during the cold season. * * Of 190 cases recorded at the veterinary school of Alfort, during the ten years from 1853 to 1863, the following list shows the aggregate numbers in each month of the year, arranged in the order of their frequency: In April, 25; March, 21; January, 20; June, 18; May, 16; August, 16; September, 16; November, 14; July, 12; December, 12; February, 10; October, 10. * * According to the observations made by Prof. Ray, at the veterinary school at Lyons, in France, the number of cases was greater during the rainy than during the dry months."

After examination of all statistics within our reach, we conclude that no season of the year offers any protection from hydrophobia, and that the time of its occurrence is simply accidental.

If extremes of heat and cold cause the disease, we should expect to find it prevailing to an alarming extent in the colder climates, such as Greenland, Sweden and Denmark, but we find that dogs and other animals, subject to rabies, are almost exempt from it in these countries as well as in the tropical regions. Dogs subsisting entirely on food in a state of decomposition do not seem more likely to suffer from hydrophobia than those having wholesome diet. The cruel experiment of depriving animals of water until death relieves their suffering, has failed to develop the much dreaded symptoms.

We believe all observers agree in this, that the dog more frequently becomes rabid than the bitch. Out of 141 cases collected by Eckel, only 15 occurred in bitches.

It is said that dogs that have been castrated are less liable to the disease.

It is also a well established fact that hydrophobia is far more common in those of a mongrel breed than in the pure blooded. While we are not prepared to say that well cared for, pure blooded dogs never suffer from rabies, except as the result of inoculation, yet from a somewhat careful examination of the subject, we conclude it to be extremely rare. It is the useless, much abused mongrels found among the poorer people of our cities and villages, people who are not able to provide proper food or shelter for their children, much less for their dogs, that are most subject to rabies, thus endangering not only the lives of human beings, but of valuable animals. If a heavy tax could be laid upon all dogs except farm dogs, and their owners forced to take out licenses, it would, in our opinion, do more toward exterminating hydrophobia than all the police regulations that can be created.

SYMPTOMS.

It is of the utmost importance that the premonitory symptoms of hydrophobia in the dog be recognized at the earliest possible moment, as the animal, at this stage of the disease, is comparatively harmless, not as a rule disposed to bite, and can be destroyed, or secured and placed under observation without risk to life.

The importance of dog owners making themselves familiar with these early symptoms cannot be over estimated, and we most respectfully and earnestly urge upon our legislature the necessity of creating a law similar to the one now in force in the state of Massachusetts, requiring all dog owners to take out licenses, and that each "license issued have printed on the same a description of the symptoms of the disease known as hydrophobia."

Among the first symptons which occur in the dog attacked by rabies is sullenness; he seems dull and inclined to seek some out-of-the-way place where he lies with his face buried between his paws and his breast; is generally restless, getting up and lying down frequently, and does not obey his master's voice with his usual alacrity. If he has been bitten by a rabid animal, the wound, which usually heals kindly, becomes inflamed and painful; he com-

mences to scratch it, or, if where he can reach it with his tongue will lick it. He busies himself in eating bits of hay, straw, sticks and other indigestible substances, and in licking cold surfaces, such as stone and metal, if within his reach.

From the first manifestation of the disease he is thirsty, and not only seeks water but laps it freely as long as he has power to do so.

The generally received opinion that rabid dogs have a dread of water, and are thrown into convulsions when brought in contact with it, is erroneous, for it is a fact that they seldom or never show any fear or dread of water.

Instead of the gloom and sullenness we have described, dogs occasionally manifest unusual affection for their masters, not only wishing to remain near them, but to lick their hand or any part of the person exposed. Although there is seldom a disposition to bite at this stage of the disease, there is great danger of inoculation, from the saliva coming in contact with abraded surfaces.

The period of sullenness and disposition to isolate himself lasts from a few hours to two or three days, when well marked delerium supervenes with extreme restlessness. If confined he is constantly rushing to the end of his chain, then back into his kennel, where he commences moving and shifting his bedding, and pawing it into a heap upon which he rests the pit of his stomach.

This new position soon becomes tiresome, and he again rises to change his bedding, and perhaps tumbles it out of his kennel. He is apt to gnaw at the wood work within his reach, and if he does this, it may be regarded as a most suspicious symptom, and he should at once be thoroughly secured. If allowed his liberty, he is inclined to wander from place to place; he seems to be pursued by phantoms, upon whom he rushes with an indescribable ferocity. The expression of a naturally savage dog at this stage of the delirium is frightful, the conjunctiva is highly injected, and the eyes look like balls of fire, the hair is rough and erect, and the tail depressed; the part bitten continues to inflame, and the itching is intolerable. His appetite is unnatural; he rejects his usual food, sometimes from disgust, at other times because he is unable to masticate it. "This palsy of the organs of mastication, and dropping of the food after it has been partly chewed, is a symptom on which implicit confidence may be placed."

Much stress has been placed upon the increased flow of saliva, especially by the older writers. That all the salivary glands become vascular, and that there is an unnatural secretion of saliva is undoubtedly true, but this in itself is no evidence of rabies. In epilepsy, the flow of saliva is much greater than in hydrophobia. Nausea and many different kinds of convulsions are accompanied with profuse flow of saliva, leading persons ignorant of this fact to pronounce dogs suffering from these maladies, mad. This excessive flow does not last longer than ten or twelve hours, when it decreases in quantity, and becomes thick, viscid and adherent.

If a dog attacked by rabies be allowed his liberty, he will, as the stage of delirium and extreme restlessness approaches, lose all affection for home, and wander over the country, gratifying his disposition to bite at every opportunity.

When he is completely exhausted, he creeps to some sheltered place, where after sleeping twelve hours or more, he dies from convulsions or sheer exhaustion.

Reliable authority states that the entire duration of hydrophobia in the dog is from two to six days.

The killing of dogs suspected of madness immediately after biting human beings, thereby rendering it impossible to determine the true condition of the animal, may, and often does, lead to great anxiety and even death.

That a person of extremely nervous temperament may have the distinctive symptoms of hydrophobia brought on through the emotions of fear and expectation alone, there is no doubt. With these facts before us we can readily see the importance of securing any animal that has bitten a person, when there is even a suspicion that he is laboring under the symptoms of rabies. The animal should be kept under observation a sufficient length of time to determine his condition beyond the possibility of a doubt, and if it can be proven that he is not laboring under any illness, or if suffering from some one of the many non-contagious maladies to which he is subject — the early symptoms of which are similar to those of hydrophobia — the person bitten is relieved from an indescribable condition of fear and anxiety which, if allowed to continue, may prove fatal.

The period of incubation varies greatly in different cases. We quote from Youatt.

"In the dog, I have never seen a case in which plain and palpable rabies occurred in less than fourteen days after the bite. The average time I should calculate at five or six weeks. In three months, I should consider the animal as tolerably safe. I am, however, relating my own experience, and have known but two instances in which the period much exceeded three months. In one of these, five months elapsed, and the other did not become affected until after the expiration of the seventh month."

TREATMENT.

It is gratifying to know that but a small proportion of persons bitten by rabid animals contract the disease. When the wound is inflicted through clothing, the virus is likely to be wiped from the teeth of the animal before they penetrate the flesh, thus rendering the bite comparatively harmless.

In fully developed hydrophobia, all known remedies fail to exert the slightest curative influence, consequently reliance must be placed solely upon preventive measures.

When the virus is once lodged in the human tissues, its removal or destruction is all that offers protection to the person inoculated. The parts wounded, if located where it is practicable, should be removed with a knife, and bleeding encouraged by the application of cupping glasses, or by immersion of the part in warm water. As soon as the blood ceases to flow, the wound should be cleansed with soap and water, and thoroughly cauterized with nitrate of silver. A person, may, however, be so unfortunate as to be bitten while far removed from a surgeon competent to excise the part, and as time is of great importance, it is well to consider the proper course to be pursued under such circumstances, while surgical aid is being procured. If the wound is upon one of the extremities, a ligature should be tightly applied around the limb between the wound and the body, bleeding encouraged by immersing the part in warm water, and if lunar caustic is to be had, it should be applied to every part of the wound.

We have the utmost confidence in the application of the caustic. Youatt claims to have applied it four hundred times, and in no single case did rabies follow the inoculation. In case the wound is deep and small, making it difficult to reach every part of the lacerated tissues, it should be enlarged with a sharp pointed knife

to a sufficient extent to allow the caustic to reach every part where it is possible the poison can be lodged. In case the caustic cannot be procured, an iron, heated to a white heat, should be applied sufficiently to insure the destruction of the virus. Better cauterize too deep than allow the smallest particle of the poison to remain.

VENTILATION.

I. VENTILATION OF PUBLIC BUILDINGS.

II. INSPECTION OF PUBLIC BUILDINGS.

1. *The State Prison.*
2. *The Institute for the Blind.*
3. *The State Capitol.*
4. *The Northern Hospital for Insane.*
5. *The Racine County Poor House.*

By General JAMES BINTLIFF, of Janesville,
Member of the State Board of Health, and Chairman of Committee.

I. VENTILATION OF PUBLIC BUILDINGS.

The proper ventilation of buildings is a duty devolving upon the individual as well as upon the state; but the solution of the problem involves so much recondite investigation, and so many costly experiments, before the precise fitness of means to ends can be determined, that state or national resources are alone adequate to the undertaking. Already modern nations have expended enormous sums in attempts to remove vitiated air from public buildings, and to replace it with the fine fluid which should oxygenate our blood; and, it is still pitifully true that, but few edifices can be named in which the conditions of health have been realized. Public buildings should be well ventilated as a means of education and experiment for the community at large, no less than in the interests of those for whose immediate use such structures are erected; and in carrying out the operations requisite to secure the main end in

view, it is of no little importance, in an æsthetic sense, that good taste should not be lost sight of in the pursuit of utility. The future of the race must largely depend upon the completeness and efficiency of the methods devised to secure a full supply of pure air in public buildings and domiciles; because, a constantly increasing proportion of our people are crowding together in densely populated communities. Very expensive machinery, although undesirable for many reasons, is still possible when society at large is the paymaster; but when individuals are called upon to meet the demand, it is self-evident that the plans must be simple, effective and cheap or they cannot be made available for the mass.

Ancient civilizations have left for our instruction some few relics of public baths and palatial edifices, affording evidence that the claims of ventilation were not entirely forgotten; but there is good reason to believe that the wisdom which suggested such works to the chosen few of the learned or esoteric class, had not even commenced to permeate the more numerous body which constituted the people. The hope that is entertained in this age, that our civilization will outlast all its predecessors, must depend for its fulfillment upon the universal diffusion, not merely of our knowledge, but of the material means which conduce to build up and preserve the race of mankind, outside and beyond the petty distinctions of nationalities, which shall be outgrown. It is of vastly more importance that humanity shall reach the acme of physical, mental and moral development, than that improved machinery and the applied powers of steam and electricity should increase the capacity to produce wealth; because, even if we take the very lowest form of argument, the inventive powers of one man in the uplifted generations may enable him to surprise the secrets of nature, placing entirely new motive forces and undreamed of facilities for advancement at the service of society; but, independent of that feature and entirely beyond it, is a duty we owe to posterity and to God, that the fullest development which can be attained within the powers of the race shall contribute to the happiness and enlightenment of our successors, fitted to rank a little lower than the angels.

Heretofore it has been the rule, that a gross utility, sometimes allied with fine taste, as in the architectural masterpieces of Michael Angelo and his followers, have been the only conditions thought necessary to be observed; hereafter, the law must be established

that within, around and above, mere beauty, grace and usefulness, which are all admirable for their own sake, there shall be a recognition and observance of hygiene, in deference to the highest excellence yet reached on this globe — human life. To attain that result, it is necessary that strenuous exertions should be made to ascertain what are the conditions which are absolutely essential to the maintenance of vitality in its best form. An engineer, full of scholastic lore, ordered the construction of expensive works to pump water down hill, and was astonished beyond measure when a more practical assistant suggested that water might be trusted to run to the point desired by the mere force of gravitation. Blunders just as absurd will be found to have been made in providing ventilating apparatus for great national and state structures; and it is greatly to be desiderd that the crucial tests of the best means suggested shall be made at the cost of society, in the aggregate, in order that the simplest ultimatum may be made available for the dwellings of the poor. Until the laws are more widely comprehended which govern the removal of impure atmosphere, and the substitution of unvitiated air, the prosecution of empirical attempts is impossible to a large proportion of our fellows, and might well tend to impoverish and disgust the men who are induced to participate therein.

The money spent in attempting to ventilate the halls of congress, although certainly extravagant, as well as apparently baneful or at least inoperative in result, has yet rendered an important service to the nation, in an educational sense, by calling attention to what is not known, and by inciting superior intellects in ten thousand various directions to essay the solution of the grand problem. The truth which has been sought with vast outlay will be found eventually close at hand, where it can be applied with a comparatively infinitessimal expenditure, and, for that reason, it is to be wished that the series of experiments shall be continued, with due precautions against fraud, until the consummation so long sought shall have been won. We shall then, though in our graves, have assisted to realize the best form which development can assume, the improvement of life, rather than its material increase. The fabled Sphynx was said to confront the venturesome traveler with a question which must be answered at the peril of his life; humanity is that traveler to-day,

confronted by questions as inexorable; and ventilation is one form which the sphynx has assumed, demanding answers which cannot be deferred nor wrongly given but at the cost of millions of lives, offered by way of holocaust upon the altar of ignorance.

We must answer for ourselves and offspring or die without the realization of our destiny, the fulfillment of our powers, the attainment of the highest happiness which has been placed within our grasp at the price of patient effort, directed by exhaustive reasoning, based on the broadest inquiry and observation.

INDICATIONS OF PROGRESS.

Surrounded by difficulties as we naturally find the subject of ventilation, considering how recent have been all efforts to grapple with the subject, it is nevertheless satisfactory to know that leading minds on this continent and in Europe, have, to a very large extent, mastered the investigation and formulated the means of relief. It would be invidious to mention particular cases in which it is believed that exceptional successes have been achieved; but those who have purused the reports of the boards of health of the several states cannot fail to be aware that excellent results have been attained; and the manual prepared by General Morin, Director of the Conservatory of Arts, Paris, deals more exhaustively with the principles, details and triumphs of ventilation, than any other work of its extent, to which we are indebted. We shall not attempt to reproduce that excellent article, because it can be consulted in the original or the translation; but we could not fail to acknowledge our obligation. The composition of pure air may be stated at very nearly 21 parts of oxygen to 79 parts of nitrogen not quite making up the hundred. Carbonic acid is found in the air in proportion generally varying from two to five parts in 10,000, consequently in a proportion too small to be stated here. The fractional remainder consists of aqueous vapor and ammonia; the latter in very small quantity sufficing to impart to the air that blue tint which is observable whenever the horizon is unclouded.

Pure carbonic acid may be incorporated with the air according to some authorities, to the extent of more than one per cent., without immediate ill effects being realized by persons breathing the atmosphere so impregnated; but respired air saturated in a much less degree with carbonic acid from the lungs, plus such animal ex-

halations as are inevitable where human beings assemble, is found to be dangerous to health and productive of instant discomfort. The fact seems to be that, air which has been breathed becomes dead, having parted with its oxygen; and, possibly, acquired some other properties which our instruments fail to define, but which render the compound a mixture perilous to life. In order to ascertain to what extent the public buildings in this state approach the standard of a proper sanitary condition, Professor Daniells, of the State University, was requested to make analyses of the air in several of the more prominent edifices in Madison, and the conditions of the atmosphere breathed in places of popular, official and scholastic resort, may be accepted as a fair sample of the conditions prevailing elsewhere throughout Wisconsin.

Prof. Daniells says that, in the Second Ward School House, at 4 P. M., 21st of March, 1877, he found a temperature of 68°, while the air without the building stood at 39° Fahrenheit: in 10,000 volumes of air he found carbon dioxide to the extent of 7.7, and the provision made for removing impure air and substituting an unvitiated atmosphere corresponded with the results thus noted. Two days earlier, in the High School room, there was a temperature of 69°, contrasted with a temperature out of doors of 27° F., and in 10,000 volumes of air 8.74 of carbon dioxide. In the same building, room of second grade, 10,000 volumes of air contained 11.9 of carbon dioxide. In the Senate Chamber, at midnight, on the 3d of the same month, the temperature being 69°, and the outer air 17°, 10,000 volumes of air contained 12.2 of carbon dioxide. In Hooley's Opera House, at 10 P. M., on the 21st of April, 10,000 volumes of air, in the dress circle, showed on an analysis 15.4 of carbon dioxide. In the gallery of the same building, the gallery windows being open during the entire evening, and the doors opened between the acts, with such marked results in temperature that the thermometer recorded a fall of 12° within ten minutes, 10,000 volumes of air contained 13.8 of carbon dioxide.

In the Assembly Chamber at the capitol, at 8:30 P. M. on the 6th of March, 10,000 volumes of air contained 16.8 of carbon dioxide; and the worst result of all, in the Fifth Ward School, in the primary room, at 3 P. M. on the 22d of March, there being 54 pupils present, one-fifth less than the whole number in the grade, 10,000 volumes of air exhibited 25.6 of carbonic dioxide, or five times the

maximum quantity which, under natural conditions, may be found in the atmosphere and respired without danger. The ill-effects which must have resulted, and which, doubtless, are continuing to result to the constitutions of the children from breathing carbonic acid, carbonic oxide, mephitic gases and exhalations, and dead, decomposing, animal matter, in air largely deficient in oxygen, the life sustaining property, can not be described in any adequate degree; but the imagination of the discreet reader will not fail to suggest that the largest benefit to be hoped from school training at that age could not offset the terrible evils which such an atmosphere must entail.

In most cases, the provision for the influx of heated air is sufficient; but in nearly every case there is a marked deficiency in the size of the apertures through which foul air must escape, supposing such motion being maintained in the atmosphere as would determine the deteriorated particles towards the points of escape. In the Assembly Chamber at Madison, the hot air registers show an aggregate capacity of 3,744 superficial feet, while the ventilating registers and grates afford an aggregate of only 1,104 feet. In the Fifth Ward school room, where the worst result has been noticed, provision was made for the introduction of hot air through a register with a capacity of 432 feet, the comb work for outlet amounting only to 220 feet. The lowest estimate of the requirements of the healthy individual is 15 cubic feet of oxygen per diem, or about 130 cubic feet of atmosphere; but, inasmuch as the breathing man vitiates more air than he really breathes, by the contaminations which he imparts from his skin and lungs, the supply of pure air, to be effective, must be largely in excess of actual consumption. It is not possible to house the human race in such edifices as would afford such an area as the necessities of the case appear to demand, if natural ventilation alone is to be relied upon. In Hooley's Opera House, with the windows open in the gallery all the evening, and the doors open between the acts, there being no adequate mechanical provision to compel circulation, there were found in the gallery 13.8 parts of carbon dioxide in 10,000; and in the dress circle no less than 15 parts of that deleterious ingredient. Where large numbers assemble in a limited space, rapidity of motion must compensate for the confined [illegible] the air in the deficient breathing space, of [illegible] 1,000 cubic feet per hour [illegible] person.

Apertures for the introduction of pure air will not suffice unless they correspond with the provision for abstracting the impure element, nor will both these provisos meet the requirement unless draft or suction, or other mechanical means, compels the air to perform its circuit in the building, as Commodore Maury has described the circumambient atmosphere upon the surface of the globe in his admirable illustration of the winds in their circuits. The trade winds are produced by the continuous flow of cold air toward a a heated surface, from which the sun causes a heated stratum of atmosphere constantly to ascend; and there being no mechanical obstacle to impede the progress, perfect ventilation results. No such beneficent and simple scheme is possible in our dwellings or public buildings; we are met by obstacles at every point; the foul air which must be removed at any cost, clings to the walls, to every article of furniture, to the clothes and persons of the occupants, and no small amount of ingenuity is demanded to overcome these innumerable impediments. Rarefaction which, in the open air, suffices, must be specially applied and adapted if it is to be effective in buildings. The plans which secure ventilation by draught when properly proportioned are probably the best; but there are conditions under which they do not secure the removal of foul air, and competent architects must modify and provide accordingly.

Discharge openings are necessary, not only near the floors, but also in the walls of buildings; and the flues into which these openings give vent must be so constructed and heated as to secure velocities which increase continuously from the first opening to the point of discharge. It is claimed with authority that, at the first opening, the velocity of ascent should be not less than 3 feet per second, assuming the air ducts to be large enough to meet the necessities of the numbers occupying the building, and that the amount must continue to increase, in buildings of great altitude, until it reaches an average volocity at least twice as great. It is not difficult to meet this requirement; an excess of heat in the egress flue from 40° to 50° above the external air will suffice to give a still higher rate of speed, and the maintenance of such temperature is quite an easy matter. There is a decided conflict of opinion between practical, experienced men, and men of large scientific attainments, as to the best methods available for warming and ventilating rooms. Your warm air, says one high authority,

must enter at or near the ceiling, and be forced down to the floor, compelling the discharge of the heavier and colder poisonous sediment, carbonic acid, by the egress apertures already mentioned. That statement is met by a practical man of many years experience in heating and ventilation, by direct evidence that the system therein proposed is wasteful, extravagant and ineffectual.

In building a house for his family in which he has embodied the ripe results of his professional labors and observations, he has raised the floors on every story to permit of the hot air being introduced between the flooring and the joists. Cold feet are unknown in that household; warmth ascending through apertures in the floor expels the cold and heavy air which has been breathed, through the ventilating shafts, and the occupants of the building are more speedily as well as more cheaply warmed than by any other process. He claims that the deleterious atoms can be removed by his method more certainly than by that which introduces warm air at the ceiling, and inasmuch as in a bad conductor of heat, he maintains that comfort and health are largely increased by what he considers the more natural scheme advocated by him. The descent of warm air from the ceiling is necessarily slow, because the lighter fluid is compelled to sink in opposition to a denser medium; whereas he allows the warm air to float upwards to the ceiling, and he is confident that nearly all the poisonous properties arising from exhalations, from breathing, and from gaslights or lamps, must immediately or almost immediately, by the force of gravitation, descend to the floor to be removed by the "exhaust" pipes. The lighter hydrogens, it is asserted, acquire density as soon as by contact with the ceiling or walls of a building they part with their heat, when, by specific gravity, they fall within the influence of the discharge ducts.

Nitrogen, which constitutes the great bulk of the atmosphere, and is the diluent of the oxygen, by which we live, is described by some scientists as suffocating matter, being largely present in choke damp, the deadly fluid to which thousands of miners have fallen victims. Nitrogen remains in excess in the air of a room artificially lighted in proportion to the number of lights and sizes of their flames, an ordinary gas-burner being considered equivalent in the consumption of oxygen to the breathing of five adults; and it requires no argument to show that such an ingredient in excess is

most undesirable. Nature has provided the wonderful combination which is expressly adapted to sustain human life, and any variation therefrom, either in the direction of increasing or reducing the proportion of oxygen, cannot fail to be immediately injurious. The conflict does not end when the question whether warm air should enter from the floor or near the ceiling has been disposed of; seeing that prescriptions differ just as widely on many other points. It is tenaciously asserted by scientists of great repute that the discharge duct from rooms or buildings should be one-third larger than the inlet flues, to afford facilities for the departure of impure air, and this notwithstanding that artificial means are resorted to to increase the velocity of the expelled current.

The other side, with all the energy of deep conviction, resolutely affirm that the inlet ducts must be sufficiently large to flow every apartment with pure warm air, so that in the event of a window being temporarily opened, the pressure of atmosphere shall be from within outwards, the rooms literally overflowing with desirable atmosphere. Failing in this condition, it is claimed as the result of many years' experience, that the discharge ducts will necessarily, under unfavorable circumstances, reverse their operations, becoming supply pipes to fill the semi-vacuüm which the other scheme always tends to produce.

Enough has been said to challenge attention to the cardinal differences of opinion which obtain among able, talented and experienced men; and it is impossible, in the brief space at our disposal, to state extensively the details of their opposing views. Unfortunately it is too evident that the rank and file of so-called ventilators know little of the important service on which they depend for profitable employment. Here and there an operator may be found with a conscience in his work, and appreciable rules for the direction of his labors and the apportionment of his machinery. But in a majority of instances in which we have sought to obtain information from men of that class, we have been met by blank incapacity, allied with empirical assurance, embodied in assertions that no rules were required, that guess-work would do, that it made no difference how many persons were to be supplied with pure air, and with like silly statements which most painfully illustrate the fact, that in matters of ventilation as in many others, the public are being misled and ditched by blind leaders of the blind.

Public buildings, which may be occupied by large assemblies, must be supplied with enough fresh air to meet the needs of every individual; and, of course, with such discharge ducts, actively worked, as will remove the refuse atmosphere; because it is useless to introduce pure, warm air in large quantities, unless the cold and mephitic strata can be expelled, and there is no process known by which that end may be secured, except the construction of discharge ducts fed from the walls and near the floors of each room artificially heated, to compel velocities of transit, such as we have already defined. In another article we have attempted to do justice to the ventilating system which is in operation in the Asylum for the Insane, at Oshkosh, and it is needless to travel twice over the same ground. The same remarks will apply to the ventilating schemes which are in use in the Asylum for the Blind, at Janesville. and in the Fourteenth District School building, at Milwaukee, recently constructed under the direction of Mr. Henry C. Koch. The methods employed, in each case, vary sufficiently to make the several establishments valuable illustrations of the means which are available to secure pure air in public buildings, and the student who would see the draught system of exhaustion and the employment of fans, worked by steam power, to force pure air into the structures to be supplied, may, with advantage, visit the institutions named.

Professional acumen must eventually be the main hope of the community, because it is impossible to apply to every building the plans which may in some instances be found effective; and nothing less than thorough scientific training, allied with practical experience, will enable the operator to determine where and to what extent the normal conditions vary, so as to render radical changes inevitable.

THE STATUS OF TO-DAY.

Careful examination of numerous public buildings, made with a view to the preparation of this article, have revealed a condition of things by no means gratifying to observe, and not flattering to the assumed enlightenment of the nineteenth century. In many such edifices, the primary conditions of healthy life have been totally neglected; and in others, provisions for ventilation have been so imperfectly supplied, as to argue in the leading minds concerned in their construction dense ignorance, or perverted information on this important subject.

In some instances we have found foul air flues in buildings without corresponding ducts for the introduction of pure air. We have found such flues opening into inhabited rooms at different altitudes, and in such manner as must necessarily convert them into means for poisoning the unfortunate occupants, whenever the ventilating duct should happen to convey from the public hall the effluvia and impoverished air of the assembled multitude into the apartments of the officials. Instead of being connected with one main shaft to carry off the foul air of the whole structure, we have found inoperative air ducts constructed separately for each room, specially liable to be converted into supply pipes whenever circumstances favored that operation. We have found buildings containing flues for the supply of pure air and for the removal of the impurer but without means to secure draught, which alone could render them of value.

In some instances which approach nearer to the realization of the desired end, the air has been found sufficiently heated to cause a current; but the smallness of the supply ducts and the low velocities attained, precluded the possibility of supplying sufficient air to be consumed by the occupants. In yet others, the means necessary to force pure air into the buildings have been found ample, or nearly so, but in the lack of facilities for the discharge of vitiated atmosphere, have existed the elements of failure to which could be traced the almost entire defeat of the beneficent design. It is useless to attempt a description of every case in which public buildings have been discovered wholly or partially unventilated, as they are all variations in some degree, from the illustrations already cited.

The grand purpose which we have in view, in naming failures in some cases, and recording successes in others, lies not in the desire to congratulate one class of operators or condemn another; but to incite the whole community to renewed effort, with fuller information and improving means. The state is interested in every experiment, because it will assist in securing the final object of inquiry, the presentation to society at large of cheap methods, embodiments of simplicity, which will enable every constituted authority tc provide for the complete ventilation of the homes of the poor, as a matter of hygienic policy. We cannot hope that the best fruits of humanity will be gathered, until the homes, unworthy of the name, which are now filled with poisonous exhalations and bad air, mak-

ing them hotbeds of depravity, pauperism and crime, shall have been purified of these physical incentives to degradation; and thus prepared for a better moral atmosphere, in which the spiritual and æsthetic nature may develop its best results.

II. INSPECTION OF PUBLIC BUILDINGS.

NOTE. — At its last annual meeting, the board appointed the undersigned chairman of a committee to examine the public buildings of the state with reference to the means adopted to secure ventilation, and t eir general hygienic condition, and to report thereon. We have been unable to complete the work assigned us during the present year; but in pursuance of that appointment the following is submitted. JAMES BINTLIFF.

STATE PRISON.

In pursuance of the resolution of the board, and in company with the secretary, Dr. Reeve, we made a visit to the State Prison at Waupun. The institution is located within an inclosure of eight acres of land, surrounded by stone walls twenty-four feet high and four feet thick. Near the front of this inclosure are erected the prison buildings proper; and, around the yard, near the walls towards the rear, the workshops, barn, laundry and other necessary buildings. The whole are of stone, substantially built, and stand on rock foundations. The central building is 85 by 90 feet in size, with a tower at each corner.

This structure consists of a basement, three stories and an attic. The basement is devoted to cooking for the whole of the male department, an officers' dining room, pantries and store room; the other portions of the building to offices and officers' rooms, and in the attic plug tobacco is manufactured from the leaf, for the use of the inmates. Extending from each side of this main building, 50 feet wide, 206 feet long, and 40 feet high, are the wings in which the prison cells are built, with a capacity to confine 540 prisoners. But one of these wings is finished in the interior; the other being used for a store room for material used in the shops, and for the products of the manufacturing department.

The cells are constructed of brick and stone, within the building, in a block in double rows, one tier above another, so that a broad passage is left entirely around this block of cells, between it and

tion at Waupun. The kindly regard for the well-being of the inmates, and the spirit of helpfulness in everything which tends towards the reformation of the characters of those committed to their care, manifested by the warden, the chaplain, and all the subordinate officers, so far as we were able to judge in the brief time allotted to us for investigation, is worthy of confidence and commendation.

THE INSTITUTE FOR THE BLIND,

Is located in Janesville. Some years ago the main structure was destroyed by fire. During 1875, one of the wings was rebuilt, and last year and this, the central part of the building, so that the whole was occupied at the commencement of the present school year. These buildings are deemed large enough to accommodate this branch of the charities of the state for years to come; and, as they are the last of our public buildings erected, we were anxious to examine them, for the purpose of learning whether the growing intelligence of the people on the importance, to healthful occupancy, of proper drainage, water supply and ventilation, for such buildings, had found an intelligent expression in their erection; because, in our public buildings, and in the residences of our wealthier and more intelligent citizens, we must look for the first application of principles which have been proved to be essential to the preservation of health. Afterwards simpler methods, securing the same results for the farmer, the artisan, and the laborer, and adapted to the cheapest dwellings, will be desired.

This institution is located a short distance beyond the city limits, about 300 yards from Rock river, on an eminence nearly 100 feet above the water level, the lot on which it is built extending its full width to the river. The state owns here 30 acres of land, all of which, with the exception of a pasture lot, garden, and the open grounds about the buildings, is covered with a beautiful grove of second growth oak and hickory trees. The foundations are laid upon the rock, which averages 25 feet from the surface of the ground. The building is made of stone and brick, with brick partitions, and iron stairways throughout; and wire in the place of lath on the ceilings to hold the plaster. Above the plaster, with proper fastenings to hold it, between the joists is filled in with brick

and cement; and above this the floors are laid, in the rooms with wood, and in the halls and corridors, kitchen and basement rooms, with tile, so that the building is substantially fire proof. The great depth of the foundations made possible a basement and sub-basement below the first story.

In this sub-basement is located THE SEWER which carries off all the waste of the building. This sewer is of vitrified pipe, elliptical in form, 3 feet in diameter, embedded in sand, which with ample fall discharges its contents into an open sewer, 300 feet from the building, thence into the river. All the connections from the building with the main sewer are properly trapped so as to prevent noxious gas from escaping backward from the sewer into the rooms. At two points in the sewer a pipe 3 inches in diameter enters it and is carried above the roof for the purpose of ventilation. In the pipe that comes to the sewer from the water-closets, wash-rooms, etc., between the trap and the point where from various parts of the building they are united, there is connected with it, both in the main building and in the wing, a horizontal pipe 5 inches in diameter. This horizontal pipe connects with a perpendicular pipe, that opens in the cupola, for the purpose of ventilating the soil pipes. In this perpendicular pipe is a gas burner which is lighted whenever, from any cause, there is a failure to secure a downward current of air from the closets, along the horizontal pipe, and upward through the perpendicular one. The heat caused by this gas light within the pipe always secures the desired result. The building is heated with steam pipes and coils. The boilers are located in a separate building, 125 feet from the main building, erected on lower ground, and connected therewith by a tunnel.

THE WATER SUPPLY

is furnished from wells and cisterns. In the sub-basement are two large cisterns, one under the boiler house and one outside the main building, the whole having an aggregate capacity of 4,500 barrels. In addition to these there are five boiler-iron tanks and four wood tanks in the attic of the building, with an aggregate capacity of 400 barrels. In addition to these receptacles for rain water, there is in the boiler house a well, drilled in the rock, 125 feet in depth, and one in the yard 147 feet in depth. In the yard well is a pump worked by a wind mill.

VENTILATION.

On the outside the basement windows there are eight flues through which a supply of pure air is received. These flues average in size three by three feet, and the air is conducted by them into the sub-basement, thence upward into sixteen brick chambers inclosing the steam coils or radiators. Here a temperature is maintained sufficient to create a circuit through the flues by which the air is distributed to every part of the building. The interior distributing flues are lined with tin, so as to offer the least possible resistance. As the pure air comes into the rooms, corridors, halls, etc., it is everywhere brought in contact with other steam pipes and radiators by which the temperature is increased and the velocity of the current quickened as it ascends the building. In each room there is one flue and register for the admission of pure air, and two of the same size for carrying off the vitiated; those in the wing being eight by twelve inches, and in the main building twelve by sixteen inches.

In the assembly room and the larger school rooms, there are two sets of flues of the same size. In the attic these foul air flues discharge into horizontal brick flues, 2 by 3 feet in size. These large brick flues meet under the cupola and discharge their contents into a perpendicular, galvanized iron tube, 5 feet 2 inches in diameter, which connects with the outer air through various openings in the upper part of the cupola. In the base of this iron tube is a campanile of steam pipe, 20 feet in length, which is heated to the degree of temperature necessary to maintain the current, secure a rapid flow of the foul air at this point, and assist the draft through the horizontal brick flues and below them. The flues are all constructed in the interior partitions, so as to prevent the possibility of their operation being interfered with by cold walls; and the more than ample capacity of the receiving flues for the entrance of pure air from outside the building enables the engineer to furnish an ample supply from the directions opposite to that from which the wind is blowing during a storm. With proper attention, this building will never fail in being properly ventilated.

THE STATE CAPITOL

At Madison furnishes an illustration of the ignorance of architects with reference to the means necessary to furnish a large building with a supply of pure air adequate to the needs of the numbers of persons who are expected to occupy it. A large flue enters the basement, in which is a fan operated by a steam engine. The pure air is forced through this flue and over steam coils of sufficient radiating powers to warm the air, which is then distributed to different parts of the building. Other radiators assist to keep the rooms at a comfortable temperature in the coldest weather; but there is no certain means of removing the foul air that accumulates. This deficiency necessarily vitiates all the attempts at ventilation, and renders the building unwholesome. When the building was erected, a register and flue connecting with the chimney in each of the offices was constructed six or more feet above the floor; and as the vitiated air, impregnated from bodily exhalations, and heated air robbed of its oxygen by gas lights, rapidly ascends to the ceiling, and carbonized air from the lungs as rapidly descends to the floor, such an arrangement for the egress of impure air was practically valueless. Moreover, for some years, the tops of the chimneys in which these flues are located were sealed, and now but four of them are open. It is impossible, therefore, with the present appliances, to ventilate the first story of the building, where the offices are located.

In the senate and assembly chambers, an attempt has been made to secure ventilation by flues from each into the open chimneys, for the egress of foul air. When the atmospheric conditions are favorable, this arrangement accomplishes the desired result, so far as the capacity of those flues will permit; but they are far from being equal to the demand when the halls are filled with an assemblage of people. And when the atmosphere outside is damp and heavy, or when a strong wind is blowing, the current in the flues frequently becomes reversed, and then the air in the chambers is speedily rendered intolerable. Last winter, a senator from the southern part of the state, who had given some attention to this subject before he was willing to take his seat, secured the placing of two grates in the chimneys of the senate chamber to furnish additional outlet for impure air. But the difficulty with all these outlets for impure

air in the Capitol building is the lack of heat in them, by which alone a sufficient current can be maintained at all times to render the rooms healthful.

It is a fact well known that frequently the health of members fails, during the sessions of the legislature; and that many of those who endure to the end leave the building with a sense of relief, and there is no doubt in the minds of intelligent men who have investigated this subject, that much of the disability experienced there is due to the lack of ventilation. Frequently these rooms are crowded with people for continuous hours; and then, providing all the appliances within them for supplying pure air and removing the impure are operated under the best circumstances possible, they possess but a tithe of the capacity necessary to accomplish the work required. With the almost universally acknowledged necessity which exists for the maintenance of healthful conditions in our public buildings, it is a matter of humiliation that our state capitol should be so imperfect.

During the evening sessions of the legislature the rooms occupied by that body are lighted by a large number of gas-lights. These gas-burners consume the oxygen from the air much more rapidly than the ordinary number of occupants; and, if the means employed to remove the impure air are both inadequate and uncertain during the day time, what must be the condition of the air in those rooms during the evening, when they are lighted and occupied by a large assemblage.

A SUGGESTION.

One of the best plans proposed for removing the impure air from the capitol building is one suggested by Dr. Kempster, the superintendent of the Northern Hospital for the Insane. It is this: Construct two flues, of sufficient capacity, from each of the legislative halls, one near the floor, and the other near the ceiling, uniting them in one at a point above the level of the ceiling, and near the cupola of the rotunda carry the flue through the outer wall of the cupola and upward between the outer and inner walls to the second projection above the gallery connecting the Assembly and Senate chambers. Under that projection, make an opening to admit the impure air within the cupola and openings below the windows which rest on the summit, for the current to pass outward into

space. The volume of heated air that accumulates in the upper part of the cupola, whenever the building is warmed, would create a strong current through these openings and through the flues, by which the air in the legislative chambers might be changed as rapidly as desirable, and our legislators provided with healthful conditions in which to do their work. This plan, based upon calculations as to the volume of air necessary to secure ample ventilation, might be extended to every part of the building at a nominal cost.

THE NORTHERN HOSPITAL

For the Insane, at Oshkosh, is furnished with the most perfect appliances for water supply, sewerage, and ventilation, which we have hitherto found in any of the public buildings of the state. The buildings were erected after a careful examination of the best structures of the kind in this country. The general plan, and each of the details, were studied with reference to its special adaptability to the purposes for which it was designed; and the arrangements for surrounding the patient with the healing forces of nature, in the best form attainable within a building, are each based upon scientific facts or deductions embodying the best results of experimental knowledge on that subject. The building is the largest in the state, consisting of a series of longitudinal and transverse wings on both sides of a center building; the whole being about 800 feet in length and three stories high, besides attic and basement. In the rear of the center building is located the boiler and engine room, fan room and gas house.

The main sewer, constructed of brick, elliptical in form, commences outside the building, and empties into the lake 1,700 feet distant, with a fall of nearly twenty feet. This sewer is frequently cleansed with a powerful stream of water, which prevents the possibility of accumulations. All the water closets, bath rooms, etc., discharge into cesspools located at convenient places in the basement. These cesspools are so constructed as to be perfectly safe, and so covered as to be air-tight. The overflow from them is conducted through vitrified pipe into the main sewer. The volume of water flowing through them is so large that upon opening one of them there was scarcely any odor perceptible. Carried above the

roof for ventilation, and downward into one of these cesspools, and under water for its discharge, with a simple trap shaped like a crook at the lower end, is a five inch iron pipe for the water closet in each ward of the building. The water closet discharges directly into this pipe without any valve, trap or other device; and the contents are carried by water at once into the cesspool. It is the simplest and most effective water closet, because the least liable to permit the return of odor within the building, of any we have ever examined.

THE WATER SUPPLY

Is excellent and abundant. In addition to its stores of rain water, the institution has upon its grounds an artesian well of unlimited capacity. With a powerful steam pump, capable of supplying at once 14 fire-hose with water with a force that sent that number of streams through an ordinary sized nozzle above the roof of the hospital buildings, the engineer was unable to draw water from this well with sufficient rapidity to effect its supply. An abundance of water is carried to every part of the building.

WARMING AND VENTILATION.

The buildings are warmed by steam and heated air. Through the main building, in which are located the executive department of the institution, officers' rooms, etc., steam coils and radiators are introduced wherever necessary; in the wards the required temperature is obtained by heated air. These buildings allow for each patient 1,200 cubic feet of space, independent of the halls and corridors; and the capacity of the means of ventilation was established on the basis of changing the entire volume of air within the buildings in 15 minutes. Established by scientific tests, this result has been accomplished.

The main flue for supplying the building with fresh air is in the basement opening into the fan room. It is six feet six inches high and ten feet wide. Opposite to the entrance of this flue are two fans, each twelve feet in diameter, the flanges being four feet six inches in length. These fans are propelled by steam power at the rate of fifty revolutions per minute, and carry into the mouth of the main flue 1,000 cubic feet of air at each revolution. Within the basement this main flue divides, one branch conducting

the air for some distance under each wing. Coming to the surface, the whole basement becomes a flue through which the air is forced with great rapidity, and carried to the extreme portions of the building. Into the basements, in the interior walls, the flues are constructed in groups for supplying each room and corridor in the building, and opposite to each group are a series of radiators, enclosed at the top and for a distance down the sides with a box. Here the air is heated and by its expansion, assisted by the pressure from the fans, a current is created in the flues. Within the rooms and corridors, the flues for the outlet of impure air are one-third larger than the supply flues. There is also an open space above each door four inches wide, and there is no threshhold on the bottom, which leaves a space one and one-half inches in width, so that the pure air that supplies the corridors circulates through the rooms as well as the direct supply, and the outlet flues being larger than the inlet, secures a constant current within the rooms from two directions.

The foul air is collected into large flues in the attic and conducted into space through the cupola on the roof of the main building and each of the transverse wings. All the appliances and arrangements of this asylum seem to us admirably adapted to secure, at all times, the most healthful conditions; and the low death rate which obtains here proves that, among similar institutions, whether in this country or Europe, it occupies the front rank, if not the foremost place, in the success with which its administration is being conducted.

RACINE COUNTY POOR HOUSE.

In their last annual report, the members of the State Board of Charities and Reform endeavored to focalize public sentiment upon some gross abuses which had been brought to light in the administration of the Racine county poor house. Through their representatives, the people of this county had adopted the method of letting the care of the poor in their county house, among whom were several insane persons, to the lowest bidder. This brutal policy had produced its legitimate consequences; and, after an investigation, ordered by the governor of the state, had been made, in which the existence of a shockingly disgraceful condition of [illegible]

lished, the board characterized the institution as the most wretchedly managed, filthy, and insufficient receptacle for paupers within the boundaries of our jurisdiction. Early in June, at the request of one of the members of the board, your committee on public buildings was induced to visit this poor house, with the purpose of examining its sanitary condition.

The building is located on a slight elevation, in a flat reach of land from which drainage is difficult, if not impossible, except by the construction of drains for long distances. It is a two-story wood building, erected upon a stone basement; and this basement is sunk into the ground apparently very nearly to the level of the flat land by which it is surrounded. The State Board of Charities and Reform, in the annual report of that board for 1871, said of it: "The basement is so wet in wet weather that the water has sometimes to be pumped out in the morning before a fire can be made in the stove." This basement is occupied for a variety of purposes, among which are: cellar, rooms for the confinement of insane persons, sitting-room for inmates, and wash-room, where all the washing for the institution is done. The floor of the wash-room is of brick; and in one corner of this room is the open mouth of the only drain from the building, into which all the water used for washing is poured. This drain has its outlet in an open ditch, but a short distance from the house, and was either out of repair or constructed so nearly upon a level that it did not clear itself, the water apparently standing in it throughout its entire length. As one of the reforms of this institution, a cesspool had been dug within twenty feet of the building and covered with earth, to which communication is had by a wooden tube extending above the surface of the ground. From one of the windows on the first story a trough extends to the mouth of the tube and down this trough are poured slops from the house.

The present superintendent and his wife appeared desirous to improve the care heretofore bestowed upon the inmates, so far as the means at their disposal will permit. They informed us that large quantities of filth from within and around the building had been removed; and that a large portion of the bedclothing and all the bedsteads they found there had been burned as the only means of destroying the vermin with which they were infested. The building had been thoroughly whitewashed throughout its interior, and

some degree of pride was manifested in its more cleanly appearance. Yet this basement with its open sewer, damp and wet, as it must be in wet weather, is utterly unfit for human habitation. At best, it is a cruel fate when insane persons, many of whom are incurable, are committed to a county poor house, and to the care of persons who have neither the knowledge nor the facilities to prevent this class of inmates from sinking below the level of the beasts of the field; and, when they are surrounded with the worst conditions the place affords, their state becomes deplorable. The upper stories of this building present a cleanly appearance; but, were they a palace, we do not see how they can avoid being infected with mephitic gases from the basement and from the cess-pool near the windows.

WATER:

AND THE WATER-SUPPLY OF WISCONSIN.

(With the replies of Correspondents.)

BY G. F. WITTER, M. D., OF GRAND RAPIDS,
Member of the State Board of Health.

When we consider how general is the presence of water in all created matter, "that it forms the larger portion of the globe, more than three-fourths of all animal and vegetable matter, 795 parts in 1,000 of the blood, 789 parts of the brain, 750 of the muscles, 116 pounds of the whole weight of an average man of 150 pounds aver-dupois," we cannot wonder at the important part it plays for good and evil, for life and death, in the history of the world, nor can we fail to recognize it as the most potent and prevailing of all the elements.

"If the character of the supply be good, there is life and health in every draught; if it be poisoned or polluted in its hidden sources, it spreads pestilence and death along its course."

When we study it more closely as it exists in the dew-drop, the rain, the rivulet and the river, when we trace it through its hidden channels in the fissures of the primitive rock, and above all in the super-saturated soils that surround us on every side, we are forcibly impressed with its amazing powers of dissolving solid matters and absorbing gases, and with its equally wonderful power as an erosive agent of carrying mountains down to the plains, and washing the plains into the rivers, lakes and seas.

THE COMPOSITION OF PURE WATER,

as given by the chemist, is one part of oxygen and two parts of hy-

drogen by measure, or eight parts of oxygen to one of hydrogen by weight, but as such water does not exist in nature, it seems hardly possibly to take it as a standard of purity for our water supply. Water which has been carefully distilled approaches the above composition, but it contains at least 1.8 per cent. by volume of atmospheric air, and not unfrequently traces of ammonia; and even if these were not present, the same objection to its use as a standard exists, i. e., that such water is not found in nature.

All known natural waters possess other constituents, such as salts of lime and other bases, which are left as a solid residue after the water has been evaporated, more or less organic matter, and traces of ammonia. How, then, can we avoid the conclusion *that such elements are natural to water*, are a part of water — ARE water as far as they go? If so, water containing them cannot be reckoned impure.

Moreover, it may readily be shown that many of these substances, particularly salts of lime, magnesia, soda, etc., are required by the body, and must be obtained from either solid or liquid food. From the valuable and detailed experiments made on various animals by M. Papillon with the view of testing the action of certain phosphates given in distilled water on the bony structure, it is not only shown that the character of the food eaten affects the composition of the bones, but that mineral matter in dilute solution is capable of being assimilated.

These experiments were, in fact, experiments on different kinds of artificial drinking waters, and they illustrate how profoundly the bodies of animals are influenced by the mineral constituents of the water which they drink.

They seem to show that the alteration of the composition of the water-supply of a community may involve consequences of vast importance to the organic structure of the body; that the very composition of the bones is affected favorably or otherwise by the quality of the water drank. If water contains lime, lime will be taken up, and will appear as phosphate of lime in the bones; if strontia or magnesia be held in solution phosphates of those earths.

If by any combination of circumstances these salts are wanting altogether or be in deficient quantity, the bones will be imperfectly supplied with mineral matter. It is said that cases of such deficient supply have occurred in Holland, in districts where the inhabitants

can obtain only rain-water for drinking purposes, and, as bearing upon the same point, it may be mentioned that the examining surgeons of the French army report that conscripts coming from districts where hard waters are used almost exclusively are men of larger and firmer bony structure than those taken from sections in which soft waters prevail. Absence of all mineral matter in drinking waters combined with absence of lime in the food can hardly fail to occasion softening of the bones, together with all the formidable disturbances of the general system consequent upon that state. It may even be possible by varying the character of the water supply, to alter or profoundly to modify the whole physical organization of a community, or to determine, by an examination of the bones of by-gone generations the character of their water-supply.

So much attention is now being directed to organic impurity in drinking-waters, that the character of the inorganic constituents has been almost lost sight of, although the instances are numerous in which serious consequences have followed the incautious use of deep spring waters; and just here a word of advice or warning, to a very large class in our community, seems in place. If, as seems almost certain, the whole organic structure of the human body is liable to alteration by the introduction of more or less mineral matter, is it not the part of prudence in the crowds of health-seekers who throng the mineral springs of the country to know, more precisely than it is feared they do know, the character and effects of the waters they drink so freely? Will it not be wiser for them to place themselves under intelligent medical supervision and advice in regard to the amount and quality of the water they shall use, than to wander, as too many do, from one mineral spring to another, to-day drinking at Waukesha, and to-morrow at Prairie du Chien, and with no better reason for using the water at either than that "Mr. A. was at death's door, and went to" one place or the other, "and became well!"

Dr. Letheby, after devoting many years to an investigation of the properties of the waters introduced into English cities, and a study of the sanitary aspects of the subject, comes to the conclusion that a moderately hard water is less likely to absorb organic substances, sustain the life of zymotic organisms, exert solvent properties upon salts of iron or affect leaden conducting pipes, than soft water.

Dr. Wilson, of Edinburgh, who has also collected much valuable material, takes the ground that the human organism requires for its proper nourishment and support a supply of certain mineral salts, among which carbonate and phosphate of lime play an important part in adding to the compactness of the skeleton, as well as in the proper performance of other functions.

Interesting and important as is the subject of the mineral constituents of our ordinary drinking water, the limits assigned this article will not admit of its further discussion at this time. We turn, therefore, to the no less important question of the various organic matters found in water, which, existing only too unsuspected, form the sources of disease, and affect whole communities in a way which is frequently ascribed to the visiting or chastisement of "an inscrutable Providence," when it is really the inevitable consequence of the grossest violation of the laws of nature on the part of men.

It is far from being our desire to awaken any unnecessary anxiety in regard to the character of the water supply, but there are some sources of contamination which must be avoided at whatever cost, if we wish to avert the danger of suffering and death from ourselves, our families and the community in which we live.

A minute quantity of putrescible organic matter may often do incalculable harm, because the fact is now generally recognized that in such matter the specific germs which produce specific diseases find the vehicle for their conveyance into the human organism, and investigation has repeatedly shown that typhoid fevers and other zymotic diseases have again and again been spread through a neighborhood by germs contained in the water used. A very striking proof of this fact is found in the Swiss case mentioned by Dr. Marks, in the report of the State Board of Health for 1876, but other proofs of the same character are unfortunately only too common, nor do we need to go to Europe to obtain them. An experiment, designed to ascertain approximately the rate at which filtration through soil takes place, will be described hereafter.

The people of Wisconsin have a most abundant supply of water whose quality is unsurpassed by that of any other state in the Union. The many rivers that flow through our territory with their tributaries will compare favorably in the purity of their waters with the Croton of New York, the Cochituate of Boston, or the Schuylkill of Philadelphia. We have absolutely no excuse for using impure or unwholesome waters for any domestic purpose.

The waters of our rivers attain to a standard of purity as high as that of any other territory of equal extent in America if not in the world. We have only to take what is so freely provided for us (and only prejudice on the part of some of our citizens in favor of wells prevents our doing so in very many localities), to raise the standard of health and decrease our death rate, which already compares favorably with that of our sister states, until we attain the proud position of being indisputably the most healthy state in the Union. In the month of July, 1877, a circular was prepared, modeled upon that prepared by the Board of Health of the state of Michigan, a copy of which is appended hereto, and sent to leading physicians in every part of the state, requesting information upon the subject of the water supply of Wisconsin.

Replies were received from a large number of those addressed, and copies of the more important of these replies are published herewith. The committee on Water and the Water Supply of the State take this method of acknowledging the kindness of the many gentlemen who responded so fully, and from whose answers to the circular in question so much valuable information was gathered; and to assure them that it is only owing to the insufficiency of the means at the disposal of the Board that their communications are not published in full. It is hoped that means will be provided in the coming year which will render it practicable for the Board to lay before the people of the state all the answers now in the hands of the committee, and also the large additional number which it expects to receive during the coming year.

In view of its inability to accomplish this object at the present time, and as the next best thing, the following digest of the omitted reports is herewith presented.

By far the larger part of the supply of water for drinking and general culinary and domestic purposes throughout the state is drawn from wells, which vary in depth, in the character of the soil in which they are dug or bored, and in that of the underlying strata. The least depth mentioned is in the report of Dr. Wilber, of Mineral Point, Iowa county, and is six feet, while the greatest depth of common wells is that of 150 feet, as mentioned in Dr. Edwin Ellis' communication from Ashland.

In a very large majority of cases, wells are curbed with pine plank of greater or less thickness, in most instances not exceeding

1½ or 2 inches; and little or no care is exercised in preventing the decay of this curbing, or in removing any portion of it which may become rotten, and it often becomes a fruitful, though wholly unsuspected source of sickness. Decaying organic matter of any kind is not an agreeable or healthful addition to our drinking water, and rotting wooden curbing not only contributes of its own substance to the water of wells surrounded by it, but, as every entomologist well knows, it affords shelter and food for many different kinds of beetles and often insects, which, living, contribute their excreta, and dying, their own bodies as further flavoring materials to the infusion, which often is boasted of as being far superior to any in the neighborhood!

Many will say in answer to this, that pine lumber is often the only accessible material for curbing their wells, and ask what they are to do. We think that in many cases this plea will be found untenable, as stone of sufficiently good quality for such uses is to be had in many localities where wood is exclusively used. Nevertheless, it is possible to use wood for curbing, and to preserve it so that its decay will be postponed for many years; let the planks used be at least three inches in thickness, and let joists to which they should be fastened, and preferably with galvanized nails, be at least six inches square; then by charring both sides and edges of the plank to a depth of about ⅜ or ½ inches, and treating the joists in the same way, a lining will be provided for a well which will not only remain sound for many years, but will for a time have the power of absorbing and oxidizing many noxious gases from the soil, and thus preventing their solution by the water. We may add that if galvanized nails are not to be had, any nails may be prevented from rusting by heating them to a temperature a little below red-heat and plunging them while thus heated into almost any oily or greasy matter. Common observation shows that iron-rust exercises a specific action upon wood, which promotes decay. Dr. Selden, of Tomah, also gives a method of digging wells which may prove valuable for many localities.

In many places bored and driven wells are taking the place of the old-fashioned dug and curbed wells, and we can but think that the change is a most desirable one, so far as the health of the community is concerned, provided that hard-glazed tubes, well cemented and fitted into each other are employed in the case of bored

wells; if this be not done, they are no better than the common dug well.

Another very serious source of contamination of our drinking water is found in filtration from cess-pools, privies and other receptacles of filth. In one report a case is mentioned of a privy, recently constructed, which is *only ten feet from a well*, and it is inferred that this well furnishes water for many individuals besides those who occupy the premises upon which it is located. It is a privy dug for the use of a store in Waupaca county, and both it and the well are probably used more or less by the customers of the establishment. It is impossible to prevent the passage of fecal matter from a vault to a well in such close proximity, let the character of the soil be what it may. Every man who has ever drained a piece of land knows that water will make its way through any soil, however impervious it may seem to be; a very high authority says upon this point: "As to the entrance of the water, the drainer need give himself no trouble; experience will prove that *you can't keep it out*, and it is astonishing how soon the water will 'learn how' to get in even if strong clay is rammed tight over the pipes." This being the case, it is needless to use argument to show that water will filter from a privy to a well, especially through a soil described as a sandy loam, and of which it is said that it "absorbs everything," and where no precautions are taken to prevent its passage, nor is it necessary to say much to prove that a well so located may be, and too probably is, a focus from which originates many a case of disease, which the most skillful physician may try in vain to trace to its source.

From the various reports which have been received, it would appear that the average distance of privies from wells throughout the state is not much over forty feet. This distance is decidedly too small, especially when the fact is taken into consideration that privy-vaults generally are mere holes in the ground, without curbing of any kind, whatever may be the character of the soil; our own observation goes to show, moreover, that these receptacles are rarely if ever emptied except it may be in the larger cities; a vault is used until it almost overflows, and is then covered over with a shallow layer of earth, or as in one case within our knowledge, with boards, a new hole is dug, over which the old building is placed, and this proceeding is renewed again and again until a

large body of the soil is contaminated, and, through the soil, the water used for all domestic purposes. Let it not be supposed, either, that contamination, and contamination of the most fatally dangerous character, does not exist where a chemical analysis fails to show any source of peril. In the case of certain organic poisons which affect the system through the blood, the experiments of Mons. Chauveau and Dr. B. Sanderson, on vaccine matter, render it well nigh certain that no amount of dilution can destroy the power of infection which these poisons possess. From these experiments it appears that if inoculation be performed with vaccine lymph after it has been very much diluted, the chance of the production of pustules is rendered somewhat less, but when the vaccination is successful, the pustule presents all of its normal features and passes through all the usual stages of development.

It is plain that there is a limit to the delicacy of our tests for organic poisons, marvelous as is the sensibility of the reagents which are at our command in the organic kingdom. There is a point beyond which the chemist is unable to pass, a region where he is powerless; in the present state of knowledge, a chemical analysis is not enough to determine the character of a given water supply as to its desirability. The rice water evacuations of a cholera patient diluted with no very large amount of water form a liquid in which chemical tests would probably fail to indicate the presence of anything which could be pronounced injurious, while yet the poison would be there, undestroyed and ready to do its deadly work the instant it might find its appropriate field for development. It would be still in the liquid, although unrecognized and unrecognizable, and physicians are now generally agreed in considering that such water is the most direct and certain, perhaps indeed the most usual vehicle for the transmission of Asiatic cholera.

There are, moreover, many instances which might be quoted, wherein cases of sickness have been traced directly to the fact that the water used for drinking purposes has been rendered foul by decomposing excremental matter which had found its way into the source of supply, and a most striking case of this kind is referred to by Prof. Daniells, of the city of Madison, where it is said that "the sky is the bluest, the air the purest, and *the water the sweetest* ever found within city limits." Prof. D. says: "A family using the water of a certain well in this city were all but one sick with ty-

phoid fever during the past spring. Three persons died. Of another family living in the same house, *using no water from this well*,* none were sick. *There were five privies within a radius of six rods from this well, and it was upon lower ground than any of them.*"

In order to settle the question of filtration through a body of soil beyond all doubt, the following experiment was devised and carried out: A spring in this place was chosen, and its water first tested for soluble chlorides, which were found present in exceedingly small quantity. At a point 42 feet distant from the spring-head, a crowbar was thrust down into the soil to a depth of two and a half or three feet, and into the opening thus made a pailful of a strong solution of common salt was poured; when this had all been absorbed, a gallon of kerosene was poured into the same aperture. *Three hours afterward* a sample of the water showed some increase in the amount of sodic chloride, and upon careful distillation a very small amount of kerosene also was obtained; a sample taken from the spring eighteen hours afterward showed a greater increase of sodic chloride, and distillation gave about two fluid drachms of kerosene.

Thus, in three hours, an appreciable quantity of two substances had made its way through soil and water a distance of 42 feet.

From this as well as from kindred experiments tried in Switzerland it would seem that no possible doubt can remain in regard to the filtration of various fluids through the soil, nor can there be any question of the fearful risk of disease and death involved in using water from wells located as are those mentioned in the reports from Waupaca county and from Madison.

Did our space permit, it would be easy to draw further facts of great interest and importance in a sanitary point of view, from the material so abundantly furnished in the replies to our circular. Here, however, albeit with great reluctance, we must bring our work to a close for the present, hoping to resume it at an early day, and to lay before the people of Wisconsin other facts in relation to their water supply.

We cannot, however, stop without acknowledging the assistance which we have received in the course of our work from Prof. Thos. W. Chittenden, principal of the high school in the city of Grand

* The italics are the writer's.

Rapids, who kindly undertook the labor of analyzing the many samples of water received from various parts of the state.

CIRCULAR No. 5, RELATIVE TO WATER SUPPLY. *

WISCONSIN STATE BOARD OF HEALTH,
JULY, 1877.

DEAR SIR: The Board of Health of the state of Wisconsin, desiring to obtain as full and accurate information as possible upon the water used for drinking and similar purposes, have appointed a committee to obtain such information and report thereon. Will you, therefore, at your earliest convenience, give answers to the questions which follow, or to as many of them as possible? In answering, it will only be necessary to give the *number* of the question without repeating it. Please forward answers by the first of September, 1877, and oblige, Yours very respectfully,

G. F. WITTER, M. D.,
Chairman of Committee on Water Supply.

GRAND RAPIDS, Wood county, Wis.

1. What is the name of the village, town, or city in which you live?
2. What is the name of the county?
3. What is the Geological character of the district in which you live?
4. What is the character of the soil?
5. How is your district supplied with water for drinking and culinary purposes?
6. If you live in a city or other place which has a system of water supply, please furnish as full particulars as may be practicable in relation thereto.
7. If there be any system of sewerage, drainage, etc. in your locality which has any connection with the system of water supply, give all particulars as far as known to you.
8. If the water supply be derived from wells, what is their average depth; general character, i. e., common, bored, driven or artesian; mention strata passed through in digging, boring, etc. Angle and direction of inclination of strata as far as known; character of strata underlying wells generally, together with any other information which you may think pertinent.
9. Is the water used for drinking hard or soft? If hard, give as nearly as possible the degree of hardness; i. e., the number of grains of lime salts per gallon.
10. Is rain water used in your locality to any extent for drinking purposes? If so give particulars in regard to receiving and storing thereof and details known to you concerning filtration or other purification prior to use.

* The circular is substantially the same as that issued by the State Board of Health of Michigan.

11. Is any system of filtration or purification in use in your neighborhood, and how do those using water so purified or filtered compare with their neighbors as to general health?

12. How far, upon the average, are privies, cesspools, open or other drains, etc., placed from wells in your district?

13. What is the least distance between wells, privies, etc., that has come under your own notice?

14. Do you know of any case or cases of disease in your neighborhood, due to filtration from drains, cesspools, privies, or the like, into wells? If so, give full particulars.

15. How are graveyards, cemeteries, etc., situated with relation to any sources of water supply in your locality?

16. Are metallic pipes used to any extent in your neighborhood? If so, of what character?

17. Have the waters used for drinking and culinary purposes in your neighborhood ever been analyzed? If so, furnish, if possible, a report of the result of such analysis?

18. If no analysis has been made within your knowledge, as above, give your own opinion as to the fitness of the water used in your locality and within the range of your own observation for drinking and culinary purposes, with special reference to the quantity of organic matter contained therein.

19. Please use your influence in your district to have the test detailed below (Heisch's test for organic matter) applied to as many samples of drinking water as possible, and PARTICULARLY TO THE WATER OF WELLS WHICH ENJOY A HIGH REPUTATION IN THE VICINITY, collating and reporting results as far as convenient.

Filter, through filter paper, flannel, or some similar material, into a clean, clear glass jar or bottle from ½ pint to 1 pint of the water to be examined; add pure cane sugar in the proportion of 25–40 grs. (say ½ teaspoonful to 1 pt.) cork or cover to prevent the entrance of any extraneous material, and set aside in a warm place, from 70° Fah. upwards, for 24 or 48 hours. At the end of that time observe whether any milkiness, opacity or bad odor has become preceptible. Water sufficiently pure for drinking should be clear and transparent, and free from all odor at the end of 48 hours.

20. Do open springs supply water to any extent?

21. Has any or all of the water supply of your district been, at any time within your knowledge, contaminated to an extent which has rendered it offensive in any way? If so, give full particulars, including cause, etc., as far as known to you.

22. Have any cases of contamination from decay of wooden pipes, curbing, etc., oxidation of metallic pipes of any kind, or any similar cause come under your observation? If so, give particulars.

23. Do you know of any case of arsenical poisoning arising from the use of Paris green for the destruction of the Colorado Beetle. and its solution and filtration into wells, etc? If so, give details.

24. What influence have such meteorological phenomena as prolonged rains, heavy snow-falls, droughts, etc., upon the water supply?

25. If there be any system of water supply, what is the amount per diem by each inhabitant? What is probably the consumption per diem by each individual in any case in your district?

26. Give any information which may be pertinent to the subject of the water supply in your district, upon any point which may have been omitted in the above interrogatories.

27. Please put this circular on file for future reference, and communicate any information of interest or importance bearing upon the subject of water supply which may hereafter come into your possession, to the commitiee as above.

By order of State Board of Health.

ANSWERS TO CIRCULAR NO. 5, ON WATER SUPPLY.

A.

TOMAH, August 4, 1877.

DR. G. F. WITTER:

My Dear Dr: With a copy of your catalogue of queries respecting water supply before me, I still prefer to answer in my own way. * *

The water used in this town for drinking and culinary purposes is, so far as I know, derived entirely from wells. They are on an average from 15 to 20 feet deep, extending through the super-stratum of sand, which is about 10 feet, on an average, and about 6 to 10 feet into a conglomerate sand rock. Largely the common well prevails, although many are bored — more now than formerly. These common wells are almost universally curbed down to the rock, and many of them become unfit for use from contamination of the water by decay of the wooden curbing.

There is no system of sewerage or drainage in this place and, notwithstanding my position as health officer, I have so far been unable to influence the town officers to enforce a thorough cleaning up, although cases of disease are constantly occurring that are clearly traceable to impurity of the water and bad odors from dung heaps, pig sties and other soufces of filth. One peculiar feature of our wells is, that when first dug or bored the water is very soft and pleasant, but it gradually becomes hard and unfit for washing. The cause is as follows: our sandy soil is largely mixed with lime-salts, and these are carried by percolation and washing from the surface into the wells; hence the change in the water from soft to hard. So far as I can learn, no analysis of the water used in this town and vicinity has ever been made, but it is not too much to say that it is very hard.

I have seen but two or three instances in which privies were placed nearer than 20 feet to a well, but, with our sandy formation, this is of course much too near. *One was only ten feet from the family well*, and you can imagine the result. After much effort, I

9. Well water is hard.

10. Yes; stored in cisterns, filtered in cistern or house filter, or both.

11. Through a brick partition in cistern; sand and charcoal; Kedzie's patent house filter. Nothing noticeable as to health.

12. Seldom more than four rods; often within 20 feet.

13. Eighteen feet.

14. A family using the water of a certain well in this city were all but one sick, during the past spring, with typhoid fever. Three persons died. Of another family living in the same house, using no water from this well, none were sick. There were five privies within a radius of six rods of this well, and it was upon lower ground than any of the privies. The water has not been analyzed.

15. Not so as to affect wells.

16. Only lead pipes from cisterns.

17. Many of the families in this city use water from the artesian well in the capitol park, which has been analyzed. No others have, to my knowledge.

18. They are generally good.

20, 21. No.

22. None.

23. No.

24. They increase it.

W. W. DANIELLS.

D.

WAUSAU, Wis., September 24, 1877.

Dr. G. F. WITTER:

Dear Sir:— I have received your circular and have endeavored to comply with your request. We have not been able to get a Health Board in this city, by reason of the *mayor* refusing to appoint.

Our water supply is furnished mainly from wells from 16 to 45 feet deep: A few get water directly from the river. Wells are curbed as fast as sunk, by reason of going through sand and gravel. Water soft but variable as to degree.

Wells recently sunk give the best water, while the supply in old wells becomes deteriorated on account of decaying curbing. I was surprised to find so many wells in which the water is no longer fit for use.

There is only one well in the city which has been bricked up, and yet all should be. We have never subjected the water to chemical analysis.

The supply varies with the rain fall from 4 to 6 feet in the course of a year. Typhoid fever has but slender hold in this city, nor have any cases of sickness come to my knowledge directly traceable to the water, although I think it must enter as a factor more and more. In a few instances I know of privies within 50 feet of wells, but the general distance is 100 to 200 feet. Our cemetery is out-

side the city limits, nearly 1¼ miles from the center, and on the same level or plateau; the inclination being toward the river, the cemetery can hardly have any effect whatever upon our water.

Yours very truly, W. H. SEARLES.

E.

SPARTA, Wis., Oct. 2, 1877.

G. F. WITTER, M. D.:

Dear Sir: — You request me to furnish the Board of Health with "as full and accurate information as possible upon the water used for drinking and similar purposes" in this village, and have given a list of questions, to which I make answer as follows:

1. Sparta.

4. A rich sandy loam.

5. We have a number of driven wells, 16 Artesian wells, but the greater part of our water supply is obtained from common wells curbed with pine boards.

6. We have no system of water supply.

7. We have no system of sewerage or drainage other than the almost perfect one given us by nature in the streams which pass through our limits.

8. Average depth of dug and driven wells, 20 feet.

9. Water is soft.

10. Rain water not used for drinking to any extent.

11. No system of filtering or purification in use here.

12. Average distance about 60 feet.

13. Least distance observed by me between well and privy is 40 feet.

15. We have two cemeteries; the one most used at present is on the high ground on the northern limit of the corporation, and is in close proximity to a populous part of the village; the other is on high sandy ground a long distance from any dwellings.

It is to be observed that the rock crops out above the surface near one cemetery, while just below it, at "Judge Stub's well," the rock is only 16 feet below the surface, and at the "North Park well" it is only 12 feet below the surface. Dug wells are usually sunk, in this part of the town, a few feet in the rock, to get a constant supply of water. Does the surface water ever penetrate through Potsdam sandstone? Is it possibls for the surface water in the cemetery to find its way down to the rock (which is only a few feet below the surface), and then be shed in the direction of the dip of the rock, southward, into dug wells? [It is decidedly possible.]

16. Iron tubing in driven and artesian wells.

17. The water of the North Park and court house artesian wells has been analyzed as follows: [illegible]

	Grains.
Carbonate iron	14.33501
Carbonate magnesia	4.03101
Carbonate lime	.40202
Carbonate strontia	.01402
Carbonate baryta	.00600
Carbonate manganese	.00072
Carbonate soda	.21030
Carbonate lithia	.02400
Carbonate ammonia	.00210
Sulphate soda	2.21430
Sulphate potassa	.64130
Sulphate lime	.18020
Chloride calcium	.60502
Chloride sodium	.14301
Phosphate soda	.06400
Phosphate alumina	.06080
Iodide sodium	.00014
Silica	.28000
Hydric sulphide	.00340

20. There are no open springs supplying water for domestic purposes.

21. The water supply of this district has not been contaminated to my knowledge so as to become offensive in any way, except in the case of rotten wooden curbing which I think is often a cause of contamination especially after heavy rains: the fungi that accumulate on the curbing are then washed down into the well, and I have often seen water in such cases thick with decaying organic matter. After a few days the water becomes clear again. This I believe to be a serious evil.

23. I know of no case.

24. Severe drouths decrease the supply in our dug and driven wells but do not affect the artesian.

All of which is respectfully submitted.

R. S. WELLS, D. D. S.,

F.

WAUPACA, Aug. 8, 1877.

1. City of Waupaca.
2. Waupaca.
3. Sandy.
4. Sandy loam.
5. From wells dug about 28 feet deep, and curbed from the top downward with pine boards. The water is found in abundance and very pure in a coarse gravel at the above depth.
7. No sewerage; the sandy soil absorbs everything.
9. Hard in some of the wells and soft in others. Those that are hard contain but little lime together with some vegetable matter blown in from the top and deposited from the sides. The wells are about four feet square, and catch flying leaves and other vegeable substances blown by the wind.

10 and 11. No.

12. Two to three rods.

13. *Ten feet!* This is one just made and used by one of the stores.

14. No.

15. The grave yard is separated from the city by a strip of marsh that empties into a small lake, and is nearly a mile from the city.

16 and 17. No.

18. I think the water in this city and neighborhood is pure as any in the state. The quantity of organic matter from causes above stated must be very small. The quantity of water in most wells is very small, and is reproduced as often as drawn out. The depth rarely exceeds two feet, and the quantity rarely exceeds 60 gallons.

20, 21, 22, 23. No.

24. But very little; any excess of water is soon absorbed by the soil.

Yours, etc.,

GEO. R. TAYLOR, M. D.

SECOND COMMUNICATION FROM DR. TAYLOR.

WAUPACA, September 22, 1877.

Dr. G. F. WITTER, *Dear Sir:* — I have procured several samples of water from different parts of the city and submitted them to Heisch's test, referred to in your circular

I find that they *all* exhibit large quantities of what I should regard as organic matter. The water has become very turbid, of a milky appearance, with a heavy deposit very much resembling that of an excess of acet. plumbi in water. The odor in several of the specimens is that of rain water that has been standing for some time in the open air.

One of the specimens (and that now used at the public school) plainly indicates, in my opinion, animal matter in decomposition — perhaps from mice or other small animals falling into the well.

Yours, etc., GEO. R. TAYLOR, M. D.

G.

PRAIRIE DU CHIEN, WIS., Sept. 6, 1877.

G. F. WITTER, M. D.:

Dear Sir: I have answered your questions as well as I can, not having time to make analyses or other minute investigation. Our artesian well is probably one of the finest in the world. I append analysis of its water, made by G. Bode, of Milwaukee.

The ground upon which our town stands is a pure sand-bank on the Mississippi river — a gravelly sand to the depth of about 150 feet. The wells are mostly drive-wells, which are easily put down through this sand, and we obtain very excellent water. The drainage is simply the absorption into the sand.

1. Prairie du Chien.

2. Crawford.
3. Limestone underlaid by sand-rock.
4. Clay loam.
5. City, by wells; country, mainly by open springs.
8. From 30 to 50 feet, common and driven; gravelly sand.
9. Hard.
10. No.
11. From 30 to 50 feet.
13. Perhaps 20 feet.
14. No.
15. None that I know of.
16. Iron.
17. Not that I know.
18. Very good.
20. In the country, yes.
21, 22, 23. No.

ANALYSIS OF WATER FROM ARTESIAN WELL.

	Grains.
Carbonate of lime	0.6222
Carbonate of magnesia	10.9739
Chloride sodium	90.2007
Chloride potassium	3.8064
Bromide sodium	0.1281
Sulphate soda	12.7978
Sulphate lime	25.3699
Carbonate iron	0.2808
Alumina	.0061
Silica	3.8430
Phosphate soda	trace.
Organic matter	trace.

Very truly, D. MASON.

H.

MANITOWOC, August 16, 1877.

1. Manitowoc.
2. Manitowoc.
3. The whole country is underlaid by a bed of limestone, varying in depth from 50 to 100 feet on the lake shore, to 0 or 50 feet above, in the form of ledges 12 to 20 miles from the lake shore. This ledge is continuous with the limestone ledge which passes east of Lake Winnebago, N. and S. The upper stratum is pure sand on the shore of Lake Michigan, depth 20 to 50 feet, underlaid with stratum of red clay. At a distance varying from ½ to 1½ miles, the upper stratum is a sandy loam with similar substratum.
4. Soil very fertile.
5. Entirely from wells, with an occasional spring.
7. Drainage mostly surface drains and has no connection with water supply except by porosity of soil.
8. Average depth of wells in city about 20 feet. Common. Mostly through sand; occasionally, gravel. At above depth we

meet with rock; but mostly sand, with occasional layers of clay and gravel.

9. Hard. Cannot give exact amount of lime salts per gallon, but it is not more than is usually found in good drinking water.

10 and 11. No.

12. 10 to 50 feet.

14. Yes; have known some cases of fever that were directly traceable to drinking water. In one instance we had an epidemic of 12 or 15 cases of typhoid in space of two blocks, which was spread by filtration through the soil, and use of water from two or three wells in the neighborhood.

15. A long distance from our water supply and what drainage there is from the cemeteries is toward the river and lake.

16. No.

17. None except what I have caused to be made or made myself.

18. With exceptions following, I find the water unusually good.

19. Have tested fifty samples from wells in different localities, and intended to be fair specimens of drinking water. Of these, twenty-eight do not respond to the test, and are therefore supposed to be pure drinking waters. The remaining twenty-two show organic matter in varying proportion. Only five have so much as to render them, in my opinion, dangerous, and these five are but little better than ditch-water. We have probably one thousand wells in the city, which, in the above proportion, would make one hundred probable foci of disease. There two artesian wells, both yielding valuable mineral waters; one that has been analyzed shows sulphate of magnesia, with other salts and a small proportion of iron in its composition. Our water supply, with a little care, would be pure and wholesome, but *criminal carelessness*, over which we have no control, and the lack of proper sewerage will, in time, contaminate a great part of it.

20, 21, 22, 23. No.

24. Prolonged rains cause a perceptible difference in the taste of our water, making it brackish, but only for a short time.

26. The only danger to our water supply arises from the present system of drainage, which is insufficient, and the close proximity of stables, privies, etc., with no provision for preventing saturation of the soil. We have not a single sewer in the city, but we have but little stagnant water. In the older part of the city, some wells have been abandoned by reason of contamination. Our city lies partly in a basin through which the river flows. This basin is surrounded by a ridge of sand twenty or thirty feet high. In the basin is the great danger; on the ridge, the water supply can be contaminated only in the course of years and by gross carelessness.

Milwaukee, Sept. 1877. J. F. PRITCHARD.

G. F. WITTER, M. D.:

I send herewith the results of an analysis of the lake water made lately by me.

The water was taken from the hydrant in my store, August 18, 1877, the pipes being then supplied from the reservoir after it had been thoroughly cleaned.

Total quantity of solid matter per U. S. gallon, 8.4971 grains.

	Grains.
Soda	0.1474
Lime	2.7832
Magnesia	1.1243
Oxide of iron	0.0430
Alumina	0.0184
Silica	0.5529
Sulph. acid	0.4055
Carbon. acid	3.2071
Chlorine	0,1720
Organic matter	0.0552

Combined as follows:

	Grains.
Chloride of sodium	0.3195
Sulphate of lime	0.6881
Bicarb. of lime	4.4606
Bicarb. of magnesia	2.3 93
Bicarb. of iron	0.0431
Alumina	0.0184
Silica	0.5529
Organic matter	0.0552

Yours respectfully,
GUSTAVUS BODE,
Analytical Chemist.

I.

BERLIN, Sept. 1877.

1. Berlin.
2. Green Lake.
3. Potsdam sandstone.
4. Sandy.
5. By wells and cisterns.
8. Wells, common average depth, 25 feet. Within one mile east, Magnesian limestone crops out; this has a slight dip eastwardly.
9. Hard; containing fully 30 grains of lime-salts per gallon.
10. Yes, to some extent; is received in cemented cisterns; a brick partition or diaphragm divides the cistern into two parts, and acts as a filter, the water being admitted upon one side, and drawn from the other.
11. Can only give the general information that such water is not wholesome.
13. Thirty feet.
14. No.
15. Out of the way.
16, 17. No.
18. I believe that the lime-salts exist in too great quantity, and that the filtered rain water affords the more wholesome supply.
19. Have had Heisch's test applied to all the principal wells in the city, and all remain clear and transparent.

Respectfully, N. M. DODSON.

WATER:

AND THE WATER SUPPLY OF THE STATE.

BY PROF. THOMAS W. CHITTENDEN, OF GRAND RAPIDS.

An eminent English sanitary engineer (Mr. Eassie) gives it as his deliberate opinion, founded upon many years of observation and experiment, "That the presumption in respect to a well-water is invariably that it is bad; that it is in fact unsafe to use a well-water without having it first examined; that the results of investigation by our first chemists warn us emphatically against well-water" generally.

At the request of Dr. Witter, the writer has devoted some time to an extended series of analyses of the waters used for drinking and culinary purposes in the state of Wisconsin, and the results have been such as to show most conclusively that the above statement holds good for Wisconsin as well as for England, with but little modification. In conducting this work, it is scarcely necessary to say that for obtaining samples of water for examination, it was needful to rely on very many persons of all degrees of intelligence, but such careful directions were given to all who undertook the task, that it is believed that with one exception only, the water arrived in the examiner's laboratory free from any impurities other than those present in it at the source from which it was drawn. The directions were as follows: "Take, if possible, a new glass or earthenware bottle or jug, clean it as thoroughly as possible, and rinse it repeatedly with the water which it is to contain, filling and emptying it at least five or six times before finally closing it up: then fill it full, cork and seal and send it to the chemist as soon as practicable." Samples bottled according to these directions were received from all, or nearly all of the [illegible] of the state, including

those of the Fox, Wolf, Wisconsin, Yellow, Black, Trempealeau and Chippewa rivers, as also from many private sources of supply; samples of the water used for drinking on the cranberry marshes of Wood county were also received, and the writer avails himself of this opportunity to return thanks to the many gentlemen who interested themselves in the work and forwarded specimens of water from their respective localities.

The idea prevails to a very great extent that well-water must necessarily be pure and wholesome for two reasons; first, because it is generally cool, clear and colorless, and secondly, because even though it be wholly derived from surface drainage, it must have parted with all impurities during its passage through the soil, which is generally held to be a perfect filter, both chemical and mechanical, upon an enormous scale. To show the fallacy of this idea we cannot do better than quote the following experiment from the admirable report of Dr. Selden, of Tomah, which forms appendix "A." of Dr. Witter's paper.

"From one gallon of water, taken from a public well which enjoyed the reputation of furnishing pure water, one pint was passed through filtering paper and twenty-five grains of pure cane sugar was added. After standing in an atmosphere of 70° Fah. in a glass-stoppered bottle for twelve hours, the water was very turbid and emitted strongly the characteristic odor of decomposing organic matter. A filter was then prepared of the subsoil surrounding the well, and packed more closely than it was before disturbed. Through this filter, water from the same well was passed until a pint was obtained, which was filtered through paper and subjected to the same test as the other. In the same time the same turbidity was noted and the same odor given off showing that no change took place in the water during its filtration through the soil. Even if the soil did naturally possess some merit as a filter, yet, in towns where imperfect policing is the rule, the soil must become saturated with the leachings of filth."

Further, let the following facts be remembered: That the well is dug, in the majority of cases, at such a distance from the house as will reduce the labor of obtaining water to the minimum; that the door yard in which the well is placed is usually the receptacle for all the sweepings from the house; that the barn yard is frequently in close proximity to the door yard, and the character of the soil and the probable amount of its power as a filter may easily be guessed.

Moreover, a well, constructed as only too many wells in this state

are constructed, *i. e.*, by digging to what is considered a sufficient depth, and lining the hole thus dug, with pine plank, is a receptacle for all the water which falls upon the surface of a circular area which has the well for its centre and a radius varying with the character of the soil, from 25 to 100 feet and even more, as well authenticated instances prove. As mentioned above, the position of the well is chosen with reference to the greatest convenience, being in many cases inside of the kitchen, scullery or wood shed. Slops of all kinds are thrown, very generally, upon the ground just outside of the kitchen or scullery door; the cleanly housewife mops her kitchen floor almost daily, and, as the writer can testify from personal observation in more than one instance, the well is so placed that a large portion of the water used in this purification finds its way directly back into the source from which it was drawn. And, finally, privy vaults and cesspools are generally mere holes in the earth, without curbing or lining of any kind whatever, are much shallower than the well, and at a distance from it, in very many cases, wholly insufficient to prevent the passage of their contents into it. If all these circumstances be considered, there will be no hesitation in affirming that the conclusions of the English sanitarian apply with even greater force in Wisconsin than in England.

Believing that an examination of water, like charity, might best begin at home, the writer began his work by making an examination of the water from the well of the house which he himself occupied, and which he had always considered rather better than that used by the most of his neighbors. A sample of the water treated by Heisch's test (detailed in the extract given above from Dr. Selden's communication), gave in the course of 24 hours unmistakable evidence of the presence of putrescible organic matter in solution, and an examination of the well, which immediately followed as a matter of course, revealed an abominable state of affairs, which, up to that time, had remained unsuspected. The depth of the well was about 12 feet; it had been curbed with pine boards, and, at the time the inspection was made, the curbing had decayed to such an extent that any of the boards composing it could be crumbled to pieces between the fingers. The well, which was under an outbuilding used as a summer kitchen, had been covered with boards to prevent the sweepings, etc. from the floor above it falling into it, and upon this covering lay a mass of filth evidently the accumula-

tion of several years. It is scarcely needful to say that water drawn from a source with such surroundings could by no possible chance be fit either for drinking or for culinary purposes.

The next examination made was of the water used by a family some member of which was generally more or less unwell. The owner of the well from which this specimen was taken had dug somewhat deeper than common, and claimed that he had struck an unusually large vein of very pure water; that no surface drainage contaminated his supply. On being pumped from the well, a large quantity of flocculent matter was to be seen suspended in the water, and upon the application of Heisch's test, after filtration, putrefactive fermentation commenced in less than twelve hours. In this instance, it is probable that the putrescible matter was derived from the washings of the kitchen, laundry slops, etc., the well being placed close to the back door, and its covering being built up level with the kitchen floor, forming in fact a part of the back stoop, over which all the water used in the mopping of the kitchen floor passed, and upon which, in summer at least, the weekly washing was done.

The first of the wells above-mentioned contained 14 grains of organic matter in solution per gallon, and the second 16 grains per gallon. The first was invariably filtered previous to use; nothing is known of the second in this respect, but the presumption is that it was used for all domestic purposes in the condition in which it was pumped from the well. The first contained a variable amount of suspended impurities; the sample of the second which was examined showed 23 grains per gallon of the suspended flocculent material mentioned, of which no examination was made; it was, however, evidently organic in origin.

Another sample from a driven well in the neighborhood of these two showed very little organic impurity of any sort; it had a slightly offensive taste, which was found to be due to a minute quantity of decayed vegetal matter; it contained traces of lime and magnesia, together with sulphates of soda and potassa.

A curious illustration of the manner in which a water originally remarkably good and pure may become so contaminated as to be unfit for use, was given in the examination of a sample of water from a spring which supplied several families. Heisch's test showed the presence of putrescible matter, and further examination showed that nitrites and phosphates were also present in consider-

able quantity. From these facts, very grave suspicions arose, as to the source of contamination, there being a disused cemetery in the immediate vicinity. Examination proved, however, that the slope of the strata of clay from between which the spring flowed was in such a direction as to render it very improbable that any drainage from the cemetery could find its way into the spring, and further inquiry brought to light the fact that some, if not all, of the junior members of the families concerned were in the habit of using the spring-head as a convenient place for the storage of minnows, frogs, &c., intended for live fish-bait. A further cause of contamination existed in the fact that water found its way into the spring from a portion of a road which had been filled in with slabs, etc., in the crevices of which great numbers of beetles and other similar insects found a congenial home. Upon the spring being thoroughly cleaned out, a cemented lining substituted for a wooden one, and proper arrangements made to divert the drainage from the road into more suitable channels, a second examination of the water was made, and it proved to be, as had been the boast of those using it, one of the best waters in the city, all, in short, that could reasonably be expected or desired.

Far different was the condition of the water from a number of springs flowing from a low bluff, lying to the north and east of the same locality, upon the edge of which the old cemetery referred to above is located. The slope of the clay, underlying the drift which forms the bluff in question, is such that a large part of the water forming these springs must, of necessity, pass through the cemetery; it is heavily charged with nitrites, phosphates and chlorides, all of which point too plainly to an animal origin to admit of much doubt that the water is simply a "strong infusion of death." It is not known to the writer whether the water from these springs is used to any great extent for domestic purposes; the time at his disposal, moreover, was not long enough to admit of any thorough or extended investigation of the character of the water used in the district which they probably supply; a question of considerable sanitary interest, however, is, whether diseases pointing to an impure water-supply prevail to any considerable extent in the district in question.

A very common error, in this section of the state at least is, that of considering water, colored by decaying vegetal matter and

possessing almost any disagreeable taste, as a chalybeate, having all the tonic and other medicinal properties of waters of that character. A tolerably large section of this city is supplied with water which, flowing through a marshy tract, has become impregnated with vegetal matter, which imparts to it a brownish tint that, taken in connection with a somewhat nauseous flavor, is generally thought to give indisputable proof of the presence of iron. Analysis shows, however, that while a trace of iron is really present, the quantity is wholly insufficient to affect appreciably either the color or taste of the water, far less to impart the very decided tint and flavor which characterizes it. As a matter of fact, very few of the samples of water examined contained iron in sufficient quantity to give, even after considerable concentration, the characteristic reaction of that metal with potassic ferrocyanide.

Among the specimens examined were two from two hotels, one the Rablin House, in this city, the other labeled simply "hotel water," having nothing to indicate the name of the house or its locality. A greater contrast could hardly be imagined than that existing between these two sources of supply. The first was of exceptional purity, showing traces only of soda and potassa, and almost entire freedom from any organic matter. The second contained lime, magnesia, soda, potassa, chlorine, phosphoric, nitrous and sulphuric acids, giving strong reason to suspect contamination by decaying organic matter of animal origin. Another sample from a private well showed the presence of a large amount of nitrites and phosphates, and from a rough diagram which was drawn by the gentleman who obtained the sample in question, it is inferred that the same state of things exists throughout the locality from which it was obtained. According to this diagram the well "lies near the foot of a hill, one side of which is rock, the other and that nearer to the well being composed of sand; upon the sandy side is situated a cemetery," its distance from the well not being mentioned. A memorandum descriptive of the well and its surroundings from which we quote, says: "The well is fifty feet deep, all the way through sand, and the soil for a large distance around is sand." Now, there is at least one case on record, narrated by Dr. A. Hägler, of Basle, Switzerland, we think in vol. XI of the German Archives of Clinical Medicine, which proves beyond all question that water may pass through more than a mile in thickness of porous

soil without being freed from organic matter in solution. This case was briefly as follows: Three cases of typhoid fever occurred in an isolated farm-house situated on one side of a mountain ridge, upon the opposite side of which stands the village of Lausen. A brook runs past the farm-house, which stream received the excreta of the three patients, and in it their bed and body linen was washed.

The brook served to irrigate certain meadows near the farm-house, and the water from these meadows filtered through the soil, as was shown by a crucial experiment, devised and executed by Dr. Hägler, and mingled with the water of a spring which supplied nearly all the inhabitants of Lausen with water, the only exceptions being those of six families who used water drawn from wells on their own premises. No fever occurred in any one of these six families, while scarcely one of all the rest escaped. One hundred and forty-four cases in all were treated, including those of children who contracted the disorder at Lausen, where they were spending their vacation, and who sickened after their return to school.

Cases like this are full of warning and instruction for all who are willing to profit by the lessons they convey. From the facts discovered by the analysis of the water from the well described above, and from the account given of the relative situations of the cemetery, and of the character of the soil lying between it and the well, there is serious reason for apprehending danger to all who use water derived from wells in that locality.

And just here it may be said that while water tested by Heisch's test, which shows any marked milkiness or turbidity, or which gives off any disagreeable odor within forty-eight hours, may be safely pronounced unfit for domestic use, it by no means follows that all waters which remain clear and transparent when subjected to treatment for that length of time are free from all impurities which are dangerous to life and health. That test, valuable as it is, for the detection of sewage and similar matters in water, gives no information whatever in regard to nitrogenous compounds which have undergone oxidation more or less complete. The presence of nitrates in water gives ground for suspicion in regard to its fitness for drinking, for it indicates the presence, in some portion of the soil through which such water has passed, of a very large amount of animal, or at least nitrogenous matter.

Still more objectionable is the presence of nitrites, and these

were present in the case referred to above in large quantity. These salts indicate an originally incomplete oxidation of nitrogenous matter, a reduction of oxides from a higher degree to a lower, or, as has been recently discovered, the presence of bacteria and their action on alkaline nitrates. If the presence of nitrites be due to the first of these causes, the soil is insufficiently aerated, and consequently its oxidizing powers are overtaxed. In the second case the inference is that some reducing agent is present, and while this agent may be in itself perfectly inert or harmless as regards the animal economy, on the other hand it may be some putrefying organic matter, and in all such cases it is the part of wisdom to assume the worst, and to avoid the use of such water for domestic purposes. Lastly, the appearance of bacteria is so closely connected with the processes of putrefaction and decay that there can be no doubt whatever of the propriety of rejecting water in which there is reason to suspect their presence. Further, the presence of both nitrites and nitrates in water indicates not only the presence originally of nitrogenous matter in the soil through which such water has passed, but if their quantity be large it indicates an overtaxing of the chemical powers of the soil, or, to say the least, that these powers are already tasked to their utmost extent, and that consequently any addition to the amount of nitrogenous matter already present will remain to be partly dissolved by the water which filters through it, and carried into wells or other sources of supply, to be drawn thence and to do the work of producing disease and death. It ought, moreover, to be generally known that nitrates are all soluble in water, the alkaline nitrates especially so, and that they impart to water a saline taste and a degree of coolness which are considered by many peculiarly pleasant and refreshing, so that the very qualities which ought to give warning of danger are held to be powerful recommendations.

In addition to the many samples of water obtained from wells and similar sources of private supply, a few samples were procured from the cranberry marshes of Wood county. These were generally good in character, none of them containing more than 3 grains per gallon of organic matter or anything harmful. One was chalybeate in character, holding 8.7 grains per gallon of carbonate of iron in solution.

The question will doubtless be asked, "What are we to do—

whence are we to obtain supplies of water for drinking and domestic purposes, if the water of our wells is as bad as you have represented it?" In answer we reply that the state of Wisconsin is blessed with an abundant supply of as pure and good water as is possessed by any territory of equal extent in the United States, and probably in the world. The waters of the Wisconsin, Black, Yellow, Wolf, Fox, Chippewa, and probably of all the rivers of the state are equal to the boasted Croton of New York, and in some instances far superior to it. In cases where no stream is available as a source of supply, greater care in digging wells, with an avoidance of the use of wood for curbing, and the exercise of common sense in locating privies and cesspools, will probably prove effective in improving the quality of the water. The excellent suggestion of Dr. Selden may also be of use in a large section of the state.

If it came within the scope of this article so to do, much might be said in relation to the construction of privy-vaults, the merits of earth-closets in respect to the water supply, the best methods of well-construction, etc., etc., as bearing upon the question of public health. Neither time nor space, however, admit of the full discussion of these subjects, even if they fell into the writer's province. It must suffice if we have succeeded in calling attention to some of the dangers which threaten us, and in arousing abler minds to a contemplation of them in all their magnitude.

SUPPLEMENTARY REPORT

ON

SMALL-POX.

BY E. L. GRIFFIN, M D., OF FOND DU LAC,
President of the State Board of Health.

In a former report upon Small-Pox, published in the First Annual Report of the State Board of Health, we endeavored to show that while it was one of the most *destructive* diseases that afflicted the state, it was also one of the most *preventable*, and that if certain conditions were fulfilled, it might be banished from the state. These conditions were shown to be simple, rational, inexpensive and sustained by the large experience of more than three-quarters of a century, and were urged upon the thoughtful attention of the citizens with the hope that they might be more generally observed.

The record of this disease in the state during the past year is eminently calculated to intensify all the facts presented in that report, and justify a renewed effort on the part of the State Board to create among the people a more general disposition to aid in eliminating small-pox from the list of death causes in the state.

During the month of March, 1876, there existed only *one* case of this infectious disease in the entire state, and that occurred in Milwaukee. No case had been reported during the preceding month, and only one during the month of January of the same year. The number of cases originating from this one during the spring and summer months was quite limited, thus affording an ample opportunity to check the spread of the disease, and a sufficient warning to be prepared against a threatened epidemic of a disease which generally makes its most fearful ravages during the cold season. But no special advantage seems to have been taken, by the local authorities, of the tardy approach of the pestilence, and the oppor-

tune moment for *stamping it out*, in its incipient stage, was allowed to pass. The apparent apathy which seemed to prevail among the constituted authorities of the city was shared in by the people until mid-autumn, when the rapid multiplication of new cases excited great alarm. So rapidly did the disease spread that by January 1st, 1877, four hundred and ninety-two cases were reported, of which one hundred and sixty-one proved fatal. Although much has since been done to check the spread of the disease, it has continued in that city with a variable degree of virulence up to the present time.

Nor has it been confined to the city alone. It soon appeared in various towns in different parts of the state. During the fifteen months preceding Nov. 1st, 1877, it has broken out in *forty* localities outside of the city of Milwaukee. During these fifteen months 1,313 cases have occurred in that city, 385 of which proved fatal. In the other forty localities in the state where the disease has appeared, there have been 378 cases, 59 of which were fatal. The sum total throughout the state during these fifteen months was 1,691 cases with 444 deaths; a mortality of 26.25 per cent.

It is painful to reflect upon the personal suffering, family distress, untimely ending of most valuable lives, commercial disturbances and other attendant evils which have followed in the train of this pestilence, and which could have been easily and readily prevented. Blame, if not criminal guilt, rests somewhere. This calamity to the state cannot be charged to an inscrutable Providence.

The constituted authorities of a people who fail to enact and enforce such regulations as will speedily check and eliminate from the community so terrible an evil as small-pox fail to apprehend their duty, and cannot complain under the severest condemnation. It is quite certain that the time is near when public opinion will hold local governments accountable for the long continuance of this disease in a community.

Here was an infectious disease, repeatedly demonstrated by sanitary science to be preventable, so far as its epidemic diffusion was concerned, starting from the smallest beginning, and spreading with such slow movement as to give ample time for protection, yet allowed to multiply its victims and diffuse itself into many localities, and even at this date remaining strongly entrenched within the borders of the state.

The chosen representatives of any city are in duty bound to protect the health and lives, as well as the property of the citizens to the utmost of their authority and power. The opposition of any minority, however large, especially if illiterate, should never for a moment be regarded, when the welfare and the lives of the whole community are in jeopardy.

In addition to the duty that any city owes to her own citizens in the line of protection from infectious diseases is the obligation it sustains to the outlying populations that visit her on business or in friendly intercourse. People that visit a city when an epidemic prevails are in great danger, unless properly warned, of exposing themselves to the contagion unawares, and conveying it unconsciously to their own families and neighbors. In this way the recent epidemic of small-pox evidently spread from Milwaukee to many inland towns in the state.

From the facts which have been reported to this Board by the resident physicians who have had charge of the cases of the disease in the several localities where it has appeared, it is ascertained that out of the forty localities where it has been transplanted during the last fifteen months, in twenty-eight instances, it was known to have come from Milwaukee. In six additional cases, there was strong circumstantial evidence that it had the same origin. Five other localities were infected by districts originally infected from that city, while into only one town was the disease positively known to have been imported from a locality outside of the state.

As these facts cannot be denied, we are compelled to admit that a grave responsibility rests upon all Local Health Authorities on the *very first appearance* of any contagious or infectious disease in their midst. No energy or vigor of action which may be put forth at a late period of a prevailing pestilence can atone for the great mistake in not fully apprehending the situation and promptly stamping out the very first *seed* case of a destructive disease. Had this been done in the case in question, it is quite likely that both the city and state would have been spared the affliction and the loss which they have sustained.

Another factor in the element of responsibility claims a notice, namely: that of *opposition* to the practice of vaccination. It has been made apparent that we have, scattered through the state, a considerable number, confined almost exclusively to the foreign

population, who through ignorance of the real facts, entertain views against vaccination, prejudicial to the public safety and in direct antagonism to all the facts which substantiate the history of this practice.

These persons discard and refuse vaccination not through an intelligent fear of some possibly implanted disease, but through a false estimate of the benefit to be derived from it. Such views beget indifference to real danger and often render the persons entertaining them real distributers of the disease.

A few, who have a claim to be considered intelligent men, have by precept and example, in private and in public, opposed this service. It is painful to reflect upon the grave responsibility which such persons assume, when, in the midst of a great public calamity, they openly discourage a practice, sanctioned by the experience and wisdom of the age, and fraught with such beneficent results to the human race. The results of such teaching and prejudice are often very disastrous.

Inasmuch as popular ignorance, fostered in some cases by false teachings, has been found a great hindrance against general vaccination, and, consequently, the eradication of the disease, it would seem advisable that some method be adopted for the better instruction of the common people upon this subject. It might be both wise and useful for the State Board of Health to cause to be prepared an article, or a series of articles, which shall show forth, clearly and concisely, the advantages of vaccination, and the dangers attending its neglect, together with the latest verified facts concerning the best virus to be employed and the best methods of operating, and that such information be published in the various principal languages spoken in the state, and by the most prominent papers in each county.

In only three localities, outside of the city of Milwaukee, can the disease be said to have reached any great degree of diffusion, or to have spread much beyond the families where it first manifested itself. The exceptional cases are Highland, Neenah and Menasha, these last named places being in close proximity to each other. Almost every outbreak of the disease in the inland towns being promptly met by vaccination, with vigorous bovine lymph, and rigidly enforced quarantine rules, was promptly quelled.

In Neenah and Menasha the disease was believed to have been

communicated by means of *paper rags* brought from Milwaukee. There were three distinct cases in as many different families which were reported at the same time, being three girls who were employed in assorting rags in the paper mills. During the course of the season there were new cases, from time to time, emanating from the mills. This special origin of small pox indicates a special and peculiar danger from infectious and contagious diseases to a community in which paper mills are located, and calls for unusual vigilance and hearty co-operation on the part of the proprietors of such establishments and the citizens.

In reply to inquiries made, touching this source of danger, Dr. J. R. Barnett, of Neenah, writes:

"I have given the question of rag disinfection some thought, and in a recent sanitary report to the secretary of the State Board of Health, I suggested the advisability of procuring some legislation compelling disinfection before rags can be handled in paper mills.

"As to the particulars of such a bill, I have thought but little; but there can be as little doubt as to the practicability as there is to the desirability of suitable legal restraints upon the trade in, and handling of, paper stock.

"Most of the stock used in the Neenah mills, of which there are four turning out an aggregate product of ten or twelve tons per day, requiring fifteen or twenty tons of rags, must of necessity come from abroad. The large cities are the depots and principal primary source of supply, because it is in the cities alone that the small economy of rag picking and saving is reduced to a science; at least what is gathered into the "junk" shops, from the country, is turned into the mass and baled up with it, sharing its various kinds and degrees of infectiveness, without adding any element of safety. The bales thus sent out to the paper mills are infernal machines for the dissemination of zymotic poisons.

"There are few cities of 100,000 inhabitants and over, where small pox is not in perennial bloom. There are, consequently, few consignments of rags to paper mills that are not at the same time consignments of potential small pox to the community possessing the mills.

"This statement is none the less true because it happens only occasionally that the mill operatives contract the disease. The women in the rag rooms are exposed to the danger of contagion almost every working day of their lives, and the community is at the mercy of the chance which dooms or spares the rag women.

"Safety for the community can be secured only in one way, namely, by the thorough disinfection of rags before they are allowed within its corporate limits. There are various ways by which the law may provide for this disinfection.

"It may provide that all warehouses, for the accommodation and

storage of rags, shall be remote from centers of population, and that dealers shall disinfect under established rules, before baling their rags for the jobbing market; or it may provide for disinfection by the manufacturer. Under any system, it should make the *sale* of infected rags a i offense punishable by the severest penalty.

It may be a question whether every incorporate city has not the power, under existing laws, to provide for its own safety, and to adopt any system of quarantine that it pleases. If cities already have this power it is clear that special legislation will be required to compel them to use it. So far it is not used, and the proverbial tenderness of all city governments for the various industries of their respective towns make it doubtful whether they could ever impose restrictions hampering in any degree their prosperity. The state should, therefore, remedy the neglect by such legislation as cannot be evaded.

"I must say that Neenah manufacturers have spared no pains to protect their operatives, so far as they could, by vaccination and by the close care of the sick, *but many will not be vaccinated*, and the care of the sick is only a mitigation of the evil, not a remedy. Under these circumstances I have been looking for a voluntary association, on their part, for the surer protection of the operatives and the city, but thus far it has not been accomplished."

If the suggestions of Dr. Barnett were accepted and acted upon by proprietors of all such industries in the state, and an inviolable rule established by which all operatives in such establishments should be excluded who did not present a written certificate from a competent physician giving assurance of the thorough protection of the bearer by vaccination, very much would be gained to the corporations and to the community in which they are located.

Some legal enactments seem necessary to meet the whole difficulty. These should be framed by some one having a knowledge of all the facts, so that the end of sanitary measures may be fully met without material damage to so important an industry of the state. A thoughtful study of this subject would doubtless bring it under the general law that always holds between the employer and the employee, namely, that what promotes the security, safety and best prosperity of the one, will minister the same to the other.

It is not within the purpose of this report to review the general history of vaccination and its great and acknowledged value to the human family, for these facts are too well known and enter too largely into the history of preventive medicine to call for such a notice. This practice, in connection with small-pox, as it has appeared in different localities in the state, has again and again vindicated its claim to the confidence of the people, and has given

abundant proof that when properly practiced, it will at once eradicate that disease from any community. Through the prompt action of local boards of health in thoroughly vaccinating all exposed parties, the disease, excepting in a few instances, was confined and stamped out before inflicting any great disaster upon the community. It was transplanted to Watertown at four separate times during the last fifteen months, but each time it was confined to the family in which it first appeared, owing to the very efficient sanitary precautions which were maintained in that city.

Many cases are reported where small children unvaccinated, after several days exposure to the infected one, were vaccinated and escaped the disease, although remaining in the same house and in the same room during its whole course.

No case is reported where a person having been recently successfully vaccinated, contracted the disease.

There has been illustrated, also, in every outbreak, the great value of an abundant and ready supply of pure and vigorous vaccine virus. We are foreed to believe that without this resource the number of cases of small-pox in the state would have been increased many hundred fold, with a largely increased ratio of mortality. Heifer lymph, in that it can be so readily and abundantly supplied, and is free from all danger and affords the maximum of protective influence, is every year demonstrating its claim to public confidence, and is being generally adopted. The fact is becoming more and more apparent to all students of preventive measures, that previous to the introduction of animal vaccine into this country in 1870, the old humanized veins had become greatly degenerated and limited in its protective influence. This is evidenced by the very large number of persons who now contract small-pox, often in its severe and fatal form, who had supposed themselves protected by an early vaccination with humanized virus. It is also made apparent by the very large number of vaccinations with heifer lymph which prove successful. It is a fresh illustration of the universal law running through the generations, touching all the great necessities of the human family, that a great want brings with it sooner or later a beneficent means of relief.

Dr. Fay, of Menasha, says of the epidemic in that city: "The disease, from the commencement, was of a very virulent and malignant form. Cases were quoted daily for a time from different

points in the city. Little or no efforts were made by the authorities to confine it within limits. I believe *vaccination with fresh animal virus alone* has saved our city from a general and universal spread of the disease."

Dr. G. F. Hunt, of West Bend, writes:

"Never, since I commenced the practice of medicine, did I do any thing which gave me more satisfaction than to see that, with *fresh animal vaccine*, I was able to stay the ravages of this terrible disease and save valuable lives. It is my firm belief that all of those whom I have vaccinated, including those who have never been vaccinated before, are forever entirely protected from small-pox. Could animal virus be used on all children for the next generation, this loathsome disease would, in my opinion, disappear entirely from among us."

We submit the following statements for the thoughtful consideration of the citizens of the state:

Every person is bound by consideration of personal interest and safety, and by obligations to the state, to put himself and his family in a condition of absolute and continued protection against small pox by thorough vaccination.

Vaccination should not be neglected until a season of panic from small pox. Thousands of valuable lives are sacrificed annually through waiting for the approach of danger before attending to this duty.

During an epidemic diffusion of small pox, *recent* vaccination is the only safeguard. At such times *every person* should be vaccinated, and this without reference to any previous operation or experience. Children who have been successfully vaccinated within two years may be excluded from this rule.

Many intelligent persons hesitate and reject vaccination through fear that some other disease may be implanted in the system. The introduction of animal virus removes all such objections, and also gives assurance of the maximum of protective influence.

Some persons forever retain an immunity from small pox by one vaccination. In others the susceptibility to the disease returns after the lapse of a few years. This can be known only by the test of a *re-vaccination*. It is wise to make this test about once in five years, until middle life, when by natural physiological changes the susceptibility to small [redacted] diminishes.

When the operation is not followed by itching or any other effect it should be repeated.

Physicians, who visit patients sick with the small pox, should be scrupulously careful not to convey the disease to others. Such visits should never be made without a change of clothing, or some equivalent precautionary measure. A rubber overcoat, with a hood which shall cover the head and much of the face, is a useful means of protection. Such a protection can be secured by a glazed muslin garment, so constructed as to cover the entire person excepting the mouth and eyes. They should never make such visits when exhausted or hungry. Since it is possible that disease germs may enter the blood through the stomach, it is advised not to swallow the saliva while in the room, or for a time after leaving it. Some time should be spent in the open air before visiting another patient. They should not attend cases of confinement, or visit families where there are unvaccinated children while in attendance upon persons sick with small pox.

The infective power of small pox commences in the stage of incubation; increases as it progresses, and is the most active during the process of *scabbing*.

To destroy the germs of small pox with chlorine gas or sulphur fumes, these must be strong enough to destroy life.

Heat, either dry or moist, at a temperature of 240° will effectually disinfect from the contagia of small pox.

VILLAGE SANITARY WORK.

By H. P. STRONG, M. D., of Beloit.
Member of the State Board of Health.

If one will take the trouble to go into a mathematical calculation, based upon the ratio of increase of population in our republic for the past fifty years, to find how many centuries hence we shall be — like the older nations of the globe — overcrowded, the mean of longevity decreasing; with famine and pestilence, at noon-day, stalking mercilessly over the land—he will be surprised to find how soon those who are to come after us must meet the terrible reality. With this natural and inevitable increase comes the tendency to concentrate in communities, villages and cities. As a result of this aggregation, we now have a large proportion of deaths from diseases that result from what is commonly termed "blood poisoning," and the ratio of death is usually determined by the degree of crowding and attendant sanitary causes. Agricultural districts usually escape, while the towns and cities furnish the mortality lists of this class of diseases, which seem to have, in a great measure, their origin in local causes. As concentration into communities increases as a natural result of increase in population, so will we have more frequent and varied epidemics, of severe or malignant character in proportion to the public neglect of the necessary rules governing or regulating causes. If our attention is properly and assiduously directed to the public welfare, the time is not very far distant when every community will have its system of sanitary regulations. As the increasing population masses, and with a better and more enlightened understanding of the causes of disease, a strict enforcement of systematic rules will modify and change, in a large degree, the character of epidemic diseases. To this end, boards of health are organized and put into motion, and it becomes a part of

our duty to make suggestions to the public and to adopt measures, not only to benefit the present generation, but to contribute our part to the great humanitarian system, which is to relieve the great crowd that is sure to follow. This work must be performed in detail and from our several points of observation. By reason of our finite understanding, and an imperfect knowledge of all the forces operating in nature, this whole work is yet in its infancy, yet we are making rapid strides in the right direction. Already, years of patient observation by many intelligent thinkers has pretty clearly established the fact, that our epidemic or blood-poisoning diseases are in a great measure, if not entirely, caused by the manner we get rid of our vegetable and animal organic refuse; in other words, we contract these forms of disease from our cess pools, privy vaults, slop drains and, as a result, our tainted water supply. A small lot is assigned us, and upon this we concentrate all these agents to infect the air we breathe and poison the water we use, and if we suffer by reason thereof, we are accustomed to refer the cause to some source remote from our dwelling. If we give the subject the consideration it deserves, the illusion will surely be dispelled, and then we are likely to turn our attention to some rational way of removing the difficulty. The important question, How to deal with this refuse? is the purpose of the following suggestions:

An article, under the above caption, has been written by Geo. E. Waring, Jr., and published in Scribner's Monthly. It is an intelligent and practical one, and, for this reason, the greater part of the following has been copied from his article:

"It is a recently recognized, but an old and universal truth, that human life involves the production of refuse matters which, unless proper safeguards are taken, are sure to become a source of disease and death. The danger is not confined alone, nor chiefly, to that element of household waste which is most manifestly offensive, but in equal degree to all manner of organic refuse. It is true that fæcal matters are often accompanied by the inciting agent of the propagation of infectious diseases. For convenience, and as indicating the more probable means for disseminating infection, we may call this agent "germs." It has not yet been demonstrated with scientific completeness that a disease is spread by living germs whose growth in a new body produces a corresponding disorder; but all that is known of the circumstances of infection, and of the

means for promoting it, may be fully explained by this theory. Typhoid fever, cholera, epidemic diarrhœa, and some other prevalent diseases are presumed to be chiefly, if not entirely, propagated by germs thrown off by a diseased body. So far as these ailments are concerned there is, therefore, a very serious element of danger added in the case of fæces to the other evil effects which are produced by an improper disposal of any refuse organic matter. That any one of all these diseases can originate from the decomposition, under certain circumstances, of fæcal matters, is not clearly determined. There is, however, good reason for believing that one common effect of the gases arising from improperly treated matter of this kind is, to debilitate the human system, and so create a disposition to receive contagion, or to succumb to minor diseases which are not contagious.

"The same debilitating effect and the same injurious influences, often result from the neglect of other organic wastes. The refuse of the kitchen sink is free from fæcal matter, but it contains in a greater or less degree precisely the kind of organic material which has gone to make up the more offensive substance. If its final disposition is such as to contaminate the water that we drink or the air that we breathe, with the products of their decay, the danger to life is hardly less than that from the decomposition of fæcal accumulations."

The methods and processes by which village households and communities may be protected against the influences that come from an excess of soil moisture, from damp walls, and from imperfect removal or improper disposal of organic filth is simple, but necessarily attended with some expense. It involves a water supply and, to be practicable, the tenements should not be too much scattered.

"We will assume that a village has a water supply sufficient to admit of the use of water closets in all houses, and to furnish a good flushing for kitchen sinks, etc. A necessary complement of this work — indeed, it should properly precede it — is the establishment of a system of sewers, by which all of this liquid outflow may be safely carried away. It would be out of the question in a small or scattered community, especially where roadways are unpaved, to establish any system which should include in its working the removal of surface water. The moment we undertake to make sew-

ers of sufficient capacity to carry away the storm water of large districts, then we enormously increase the scale and cost of the work.

"So far as the removal of house sewage alone is concerned, the work need by no means be very costly. If a tolerable inclination can be given to the line of sewers, say a fall of one in two hundred, a six inch pipe will have a capacity quite up to the requirements of a village of 2,000 inhabitants, using 100 gallons of water per day per head. It will, however, be safe to use a pipe of this size only when it is true in form and carefully laid, so that there shall be no retarding of the flow at the joints from the intrusion of mortar, or any other form of irregularity. * * *

"The bottom of the trench should be brought exactly to the required grade, and too much care cannot be given to the thorough filling with cement of the space between the socket and the pipe inserted into it, the whole circle being well flushed and wiped, so that there may be no possibility of leakage.

"The objection to leakage is twofold: Sewage matters escaping into the soil might contaminate wells and springs; and it would also rob the flow through the pipes, of water needed to carry forward its more solid contents. The continued efficiency of these small drains for carrying away the solid or semi-solid outflow of the house is dependent very largely upon the presence of sufficient water to create a scouring current. While eight inch pipes are admissible as a safe-guard against imperfect laying, they are liable to the grave objection that where the service to be performed is greatly less than their capacity, the stream flowing through them will not be sufficiently concentrated to carry forward the more solid parts of the sewage. Up to the limit of their capacity, six inch pipes, properly laid, are greatly to be preferred, as insuring a deeper stream, which will more generally attain the velocity of three feet per second, needed to move the heavier constituents of the sewage."

After giving directions in detail for laying the pipes, and indicating that where it may become necessary to attach a house or lead drain, there should be used a length of pipe having a side branch oblique to the direction of the flow to receive such connection, he proceeds to say that: "Up to a diameter of 15 inches, it is cheapest to use pipes; but for 18 inches or more, brick-work is the

cheaper, and at that size—a regular flow of water being insured—the slight roughness of brick-work offers no serious objections. * *

"Properly graded and smoothly jointed, a four-inch pipe will carry more water than even the largest boarding house or country hotel is likely to discharge. There is, however, a tendency in all house drains to become filled in the early part of their course by the accumulation of grease and solid matters caught in the grease. When no form of grease trap is used, there is a certain argument in favor of the use of a six-inch pipe for the upper part of house drains. The use of a grease trap, however should always be insisted upon, and with its aid these obstructing matters will be retained, and the outflow may be perfectly carried by a four-inch pipe. * *

"The grease trap referred to above, may be any form of reservoir which will retain the flow from the kitchen sink until it has time to cool, when its grease will be solidified, and will float at the surface. The outlet from this trap should be at such a distance below the surface of the water that there will be no danger of its floating matter passing in with the discharge." The device of the English engineer, Mr. Rogers Field, seems to answer all the purposes indicated. It is simply a reservoir, holding about 30 gallons, with an outlet pipe bent in the form of a syphon and extending to nearly the bottom of the tank. "This retains all the outflow from the kitchen sink until it is nearly full, when any sudden addition of a few quarts of water, as from the emptying of a dish-pan, brings into action the syphon, whose entrance is near the bottom, and this syphon rapidly discharges all of the contents above its mouth in a flow having sufficient force to carry forward, not only any solid matters which it may contain, but also any ordinary obstructing accumulations in the drain below."

Mr. Waring says: "Although the flush tank may receive no fæcal matter, and even though the house-maid's sink may not deliver into it, it will contain in the discharge from the kitchen alone an amount of organic matter which will produce offensive and dangerous gases by its decomposition. To provide for the safe removal of these gases, a ventilating pipe should be carried up to some point not near to any window or chimney top. From the time the sewers are ready for use, no accumulation of fæcal matter or other organic household waste should be allowed to remain in the village. All

old vaults and cesspools should be filled with earth, and disinfected by the admixture of lime with the upper layers of the filling. The use of water closets in all houses should be made imperative, and the construction and arrangement of soil pipes and of all outlets, should be regulated by the health authorities."

He then gives the details of a plan for the construction of soil pipes with ventilators, etc., and then considers the sewage discharge. "Important as it is to secure the proper arrangement and construction of sewers and house drains, it is still more important to provide for the safe disposition of the sewage.

"We must begin at the outset with the understanding that all sewage matters not only are of no value to the community, but that it will cost money to get rid of them. There is hardly an instance, after all the efforts that have been made, of the profitable disposal of the outflow of public sewers. The theoretical value of the wastes of human life is very great, but the cost of any method for utilizing it seems at least equally great. The question of cost is so much more important (to the community) than the question of agricultural value, that the practical thing to do is to make such disposition as will cost the least, while fully meeting the best sanitary requirements.

"So far as village sewage is concerned, there are three means open for its disposal; to discharge it into running water, or into deep tide water; to use it for the surface irrigation of land; or to distribute it through sub-irrigation pipes, placed at a little distance below the surface of the soil. Experiments are being made with more or less promise of success in the direction of the chemical treatment of this liquid so as to purify its effluent water, and retain, in a solid form, and in combination with certain valuable added ingredients, all of its undissolved impurities.

"The cheapest way to get rid of sewage is to discharge it into a running stream, or into tide water. So far as the community itself is concerned, this is often the best way, but there will very often arise the objection that the community has no moral or legal right to foul a stream of which others make use in its further course. When the amount of water constantly flowing is very large, and when the discharge is rapid,— any given part of the sewage reaching the open air within a few hours from the time of its entering

the pipes — and where it flows in moving water for a considerable distance before reaching others who may have occasion to use the stream, no practical danger is to be apprehended. But where the sewage is more foul, more sluggish, or exposed in the open current for a shorter time, the danger may be serious.

"Where an unobjectionable natural outflow cannot be provided, the irrigation of agricultural lands affords the best relief. The action of vegetation, the oxidation of which takes place in the upper and well aerated layers of soil, and the well known, but not yet fully explained, disinfecting qualities of common earth, are effective in removing the dangerous and offensive impurities, and in converting them into a more or less important source of fertility."

After giving his plan in detail and suggesting the means to remedy any defects in this system that may present themselves, he gives a plan for the distribution of sewage through irrigation pipes, laid at a depth of ten or twelve inches below the surface of the ground. For the large number of villages that are without a water supply and where the houses are too scattering, and the street lengths too great to make it advisable that the heavy cost of any form of public sewerage should be assumed, he says that: "In all such villages, the public authority, or the active influence of the Village Improvement Association should be exerted to secure a regular and systematic adoption of some more perfect system for the private disposal of household drainage than is usual. Fortunately, the best system is the cheapest.

"No form of cesspool, no leaching vault, and no cemented tank should be allowed under any circumstances. Neither should there be permitted any form of the old-fashioned, out-of-door privy with a vault. Every household should be supplied with water closets, or well arranged earth-closets.

The foul water discharge of kitchen sinks, or of whatever form of slop-sink is used for the water of bed rooms should discharge into a flush tank, and should be led from this by a tightly cemented four inch drain to a tight settling basin in the ground beyond. If water closets are used, the soil pipe should deliver into the drain between the flush tank and the settling basin. The settling basin, flush tank, soil pipe, and the connecting drains should be amply ventilated. The outlet from the settling basin should be carried

by well cemented, vitrified pipes (four inch) to the connection with subsoil irrigation pipes. The flush tank discharging, at each operation of its syphon, about thirty gallons of liquid, two hundred feet of drain, unless the soil is very compact, will dispose of the whole discharge with sufficient rapidity. The tank being emptied, the flow ceases, and, within a very short time the drain becomes empty of its contents, which are absorbed by the sponge-like action of the earth, and are subjected to the combined influence of the roots of plants, and of the concentrated oxygen contained among the particles of the soil. They will soon have their character entirely changed, so that the earth will become purified, and will be ready to receive the next discharge from the tank. In the case of my own drains, after five years of unremitted use, the gradual accumulation of bits of grease and more solid matters obstructing the drains, there appeared undue moisture about their upper ends. All that was then necessary was to re-open the trenches and remove, wash and replace the tiles. This operation cost for a length of 200 feet less than three dollars.

"For any ordinary household of six or eight persons where the water closets is not used, two hundred feet of drain of this sort will be sufficient. If there are water closets, it may be well to duplicate the length; and to provide for the necessary connections to lead the liquid to the drains, we may assume that, in all, five hundred feet of length will be required. The cost of two inch tiles, at the works, in small lots, and where collars are finished, is about three cents per foot, and we will suppose that transportation will increase the cost to five cents per foot, making the cost of this item twenty-five dollars. The strips of board (three inches wide) will cost, at a very liberal estimate, five dollars more, and the cost of digging and laying not more than another five dollars, so that the establishment of this means of disposal, under the most liberal allowance of prices, will not exceed thirty-five dollars. Ordinarily, especially where neighbors combine to buy their material in larger quantities, it will hardly exceed one-half that amount. This, be it understood, is for a complete and permanent substitute for the expensive and nasty cess pools now so generally depended upon in the country.

"The earth closet was invented by the Rev. Henry Moule, vicar of Fordington, in England, more than ten years ago. It progress, in England, has been considerable, and its introduction there has re-

sulted in a profit to the company undertaking it. In this country it has met with less general favor; two companies, with large capital, after expending all their resources, have been obliged to abandon their attempts to build up a profitable business.

"Having been actively interested in the enterprise from its inception, and, having given constant attention to the merits of the system, I am to-day more than ever convinced that the solution of one of the most difficult problems connected with country and village life is to be sought in its general adoption. The public reports of sanitary officers in England, who have investigated the subject to its foundation, fully confirm every thing that has been claimed by the advocates of the earth closet, unless, perhaps, in connection with the incidental question of the value of the product as a manure. The only thing which now deters the authorities of some of the larger manufacturing towns of the north of England from adopting the dry earth system as a means of relief, under the sharp exaction of the law that prohibits their further fouling of water courses, is the belief that the labor of bringing into the town the enormous amount of earth required to supply such an immense number of closets and the labor of removing the product at frequent intervals, would be so great as to constitute an insurmountable obstruction.

"I have recently concluded an experiment of six years' duration, the result of which serves to show that this objection to the adoption of the earth closet system may be set aside, or at least reduced to such proportions as to make it unimportant. In the autumn of 1870, I had brought to my house, where only earth closets are used, two small cart loads of garden earth, dried and sifted. This was used repeatedly in the closets, and when an increased quantity was required, additions were made of sifted anthracite ashes. I estimate that the amount of material now on hand is about two tons. We long since stopped adding to the quantity, finding the amount was ample to furnish a supply of dry and decomposed material whenever it becomes necessary to fill the reservoirs of the closets.

"The accumulations under the seats are discharged through simply arranged valves, into bricked vaults in the cellar. When these vaults become filled — about three times in a year — their contents,

which are all thoroughly decomposed, are piled up in a dry and ventilated place, with a slight covering of fresh earth to keep down any odor that might arise. After a sufficient interval these heaps are ready for further use, there being no trace, in any portion, of foreign matter, nor any appearance or odor differing from that of an unused fresh mixture of earth and ashes. In this way the material has been used over and over again, at least ten times, and there is no indication to the senses of any change in its condition.

"A sample of this material has recently been analyzed by Prof. Atwater, at the Connecticut Agricultural Station, at Middletown. The analysis shows that it contains no more organic matter than Prof. Voelcker found in fresh earth prepared for use in the closet — say about two hundred pounds — nearly all of which organic matter is undoubtedly contained when first made ready for use. In my case there was an addition at a moderate calculation of at least 800 pounds of solid dry matter during the six years' use by an average of four adult persons. Prof. Voelcker's analysis showed that the unused earth contained about twelve pounds of nitrogen. Prof. Atwater's analysis showed that my two tons contained only about eleven pounds of nitrogen. By calculation the 800 pounds of solid dry matter added in the use of my material contained 230 pounds of nitrogen.

"Doubtless the constitution of Prof. Voelcker's sample was somewhat different from the original constitution of my own; but, practically, except perhaps for the addition of a trifling amount of residual carbon remaining after the decomposition, they were about the same, and after being used ten times over, the whole of the 800 pounds of organic matter added, including 230 pounds of nitrogen, seem to have entirely disappeared.

"It becomes interesting and important to know what has become of this added matter. That it was absorbed into the particles of the earth is a matter of course, and the result proves that after such absorption, it was subjected to such a chemical action of the concentrated oxygen always existing in porous dry material as led to its entire destruction. Porous substances condense gases — air, oxygen, etc.,— in proportion to the extent of their interior surface. The well known disinfecting action of charcoal — the surface of the interior particles of which equal from fifty to one hundred square feet to each cubic inch of material, and all of which surface

is active in condensing oxygen — is due not simply to an absorption of foul smelling odors, but to an actual destruction of them by slow combustion, so that the same mass of charcoal, if kept dry and porous, will continue almost indefinitely its undiminished disinfecting action.

"The earth used in the closet is a porous material, sufficiently dry for the free admission of air or of oxygen. The foulest materials when covered with dry earth, at once lose their odor, and are in time as effectually destroyed by combustion (oxygen) as though they had been burned in a furnace. The process is more slow but none the less sure; and it is clear that in the case of my dirt heap the foul matters added have thus been destroyed. The practical bearings of this fact are of the utmost importance. Earth is not to be regarded as a vehicle for the inoffensive removal beyond the limits of the town of what has hitherto been its most troublesome product, but as a medium for bringing together the offensive ingredients of this product, and the world's great scavenger, oxygen. My experiment seems to demonstrate the fact that there is no occasion to carry away the product from the place where it has been produced, as, after a reasonable time, it has ceased to exist, and there remains only a mass of earth which is in all respects as effective as any fresh supply that could be substituted.

"The quantity necessary to provide can be determined only by extended experiment; my experiment proves that the amount needed does not exceed one thousand pounds for each member of the household, and that this amount once provided will remain permanently effective to accomplish its purpose.

"With a suitable public supply of water for the purpose, and with a suitable means of disposal, nothing can be better, and nothing is more easily kept in good condition than well regulated and properly ventilated water-closets. Where these are available, with enough water for their flushing, their use is to be recommended. When there is not sufficient water, there a well regulated system of earth-closets seems to be imperatively demanded. By one process or the other we must prevent the fouling of the lower soil, and the consequent tainting of wells and springs, and the ground under houses and adjoining their cellars. With a system of sub-irrigation pipes which deliver foul matters into earth that is subject to the active operation of oxydizing influences, we need fear no con-

taminating of the deep and unaerated soil. It would be better, however, where this system is used, for the disposal of the out-flow of soil-pipes, to avoid the use of wells. As a general rule, it is safer not to use for drinking purposes the water of any well near a house or a stable — practically, it is better not to use wells at all as a source of water for domestic supply. Filtered cistern water is greatly to be preferred."

THE VALUE OF VITAL STATISTICS.

By Prof. JOHN E. DAVIES, M. D.,
University of Wisconsin.

In most of the questions of life, even the most momentous, our actions are based upon mere probability. Representing absolute certainty by *one*, in nine-tenths of our decisions concerning common affairs, we are doubtless determined to act by probabilities whose numerical value does not much exceed *one-half*. While, in many cases, where great prizes are at stake, or the consequence of failure are very disastrous, we do not hesitate to take up with one chance among a thousand, or a million; and we sometimes feel compelled to act, even if blindly, under the influence of mere hope or fear, being, meanwhile, utterly ignorant as to whether we have a single chance for us, among the infinitude of possible chances for and against us.

It is, nevertheless, always an advantage to know beforehand, if we can, the numerical value of a risk; even, where from the nature of the case, we are unable to change, in any manner, the circumstances that govern this numerical value. We can thus act intelligently, even if we choose to act unwisely, and we are able to fix responsibility where it belongs. We trace more readily the connection between cause and effect, and are better able to judge whether supposed *causes* are such in reality or not.

The numerical measure of the probability of an occurrence is the *ratio* which the number of chances *favorable* to it, bears to the *total* number of chances favorable and unfavorable. When *all* the chances are favorable, this ratio, of course, becomes *one*.

In many cases this ratio is fixed and determinate in the nature of the risk, and we may happen to know its value beforehand; or we may be able to calculate it beforehand by more or less simple processes

in arithmetic or algebra. In such cases the probability is called an *a priori* one. For example, we know beforehand, that in tossing an unloaded coin, the chances in favor of the turning up of a head at a given toss, are as one to two; or that, in the throw of a die, the chances for an ace at a single throw are as one to six. So also the chances in various games, are fixed in their value by the total number of cards in the pack, the number of cards of each kind, the number of persons playing, and the adopted rules of the game. Thus in a game of whist we may readily ascertain that the *a priori probability* that the dealer has precisely three trumps besides the trump card, is 4,662 divided by 15,875, or that the chances for it are somewhat less than 1 to 3; that the chances for "honours" are as 650 to 1,666; that there are 13 chances out of 8,192, to get six "by tricks," or 1,716 chances out of 8,192 to get one by the same, etc.

But by far the most important cases among probabilities, are those in which we do not thus know the antecedent probability of the events concerning which we inquire. We are then compelled to resort to experiment, or to the observation and record of a large number of cases under very variable conditions, in order to infer the probabilities in favor of future events, from the observance of those events that have passed. A probability, so ascertained, is called an *a posteriori* one. For example, in the case of the coin, if *a very large number* of throws brought down a preponderance of either heads or tails, we should be warranted in inferring the unsymmetrical structure of the coin, and hence, a probability greater than one-half in favor of one side or the other at a single toss; because in all cases where a *symmetrical* coin *has* been tossed *a very large number of times*, and by different persons, the number of heads and tails are approximately equal, and tend nearer and nearer to equality as the number of trials increases.* So, in estimating the probable number of deaths from a given disease, likely to occur during any specified time in a stationary community, we should have to be guided, however imperfectly, by statistics or tables of

* An interesting table of the results of a great many series of trials as to the occurrence o heads or tails in the throw of a coin will be found in De Morgan's Formal Logic, p. 185. In those trials there were 2,044 tails to 2,048 heads. Buffon is, also, there cited as having made a similar trial, with the result of 1,992 tails to 2,048 heads.

In Jevon's Principles of Science will be found a record of the heads and tails occurring in different *sets* of trials, each set having an increasing number of tosses. In these tables are seen very clearly the tendency towards an equality of heads and tails as the number of tosses was increased.

mortality for that community, gathered over as great an area occupied by the community, and during as long a period of time as possible. † It is seen, at once, that probabilities of this latter class are, at the same time, both the most interesting and the most uncertain.

In order, however, that inferences in regard to the future, founded upon the experience of the past, may have their due value or weight, it is necessary that besides the utmost conscientiousness in recording things exactly as they occurred, and in giving full statements of all the simultaneous conditions which were likely to have any bearing upon the events, it is necessary, also, that the *number* of cases recorded, be both very great and taken under a sufficiently great variety of circumstances, so that the law of averages may have place. For "experience actually testifies that events of a given species do, under given circumstances, tend to recur with definite frequency, whether their true cause be known to us or unknown. Of course, this tendency is, in general, only manifested when the area of observation is sufficiently large. The judicial records of a great nation, its registries of births and deaths, in relation to age and sex, etc., present a remarkable uniformity from year to year. In a given language, or family of languages, the same sounds and succession of sounds, and, if it be a written language, the same characters and succession of characters recur with determinate frequency. The key to the rude Ogham inscriptions, found in various parts of Ireland, and in which no distinction of words could at first be traced, was, by a strict application of this principle recovered. The same method has been applied to the deciphering of the cuneiform records disentombed from the ruins of Nineveh, by the enterprise of Layard."—*Boole's Laws of Thought.*

This important law of averages may be stated in various ways and, among others, as follows: *In any very large number of repititions of the same event, all causes which are merely fortuitous or non-essential to the production of the event, tend ultimately to balance each other, by being as frequently absent as present, leav-*

† Of this kind is the famous discussion by Laplace of the number of births in Paris and London, whereby, from the record, 770,741 births at Paris, of whom 393,386 were boys and 377,-355 were girls; and 1,436,587 births at London, of whom 737,629 were boys, and 698,958 were girls, he deduced the *a posteriori* probability of 328,268 to 1. that for some reason or another the birth of a boy was, on the whole, more likely at London than at Paris: the records of the latter place, discussed alone, also showing at Paris a greater probability, for some reason, in favor of the births of boys.

surance or annuity purposes furnish for France the following interesting ratios: Number of births to the number of marriages, one hundred to twenty-two; number of marriages to the number of inhabitants, one to one hundred and thirty-three in the great cities; one to one hundred and three in the small cities and villages; one to one hundred and thirteen in the rural districts. Number of widowers to widows, one hundred to three hundred and thirty-three; number of first marriages to number of second among men, one hundred to twenty-nine; among women, one hundred to nineteen; number of legitimate children to natural children, thirteen to one; number of births of boys to births of girls, legitimate, one hundred to ninety-four; illegitimate, one hundred to one hundred and five; number of deaths in one year, to the number of living in that year, one to twenty in large cities; one to thirty-two in the villages, and one to forty in the country. This ratio expresses the measure of the mortality or the yearly risk of dying. The following ratios give the measure of the fecundity, viz: in the great cities, the number of annual births to the total number of persons then living was about one in thirty; for the villages, one in twenty-four; for the country, one in twenty-two.

An estimate for all of France, gave the number of deaths of men to the number of deaths of women, as one hundred to ninety-eight.

In the French tables, account has been taken also of the variation of the population during the time for which the tables were constructed. This should always be done, if possible, where the changes are considerable; for tables of mortality only express *exactly* the law of mortality when the number of individuals is *infinite*, and the population is *stationary;* and such tables are, consequently, more and more exact in proportion as the numbers compared are greater, and as an approximation exists to the stationary state. Special tables should be constructed for years of war, epidemics, etc. According to the discussions by Prof. Bartlett, of the *law of mortality*, furnished by the tables of the New York Mutual Life Insurance Company, in comparison with those of all the other most reliable tables of mortality, the mathematical function expressing this law is about the same for all, and I believe is received by competent insurance actuaries as a close approximation to the true law of human mortality. The discovery of the existence of any such law would have been impossible without the

previous careful records upon which the various tables of mortality are founded.

The *direct* use, however, of all tables of vital statistics, whereby average probabilities for the future are calculated, with a greater or less degree of certainty from the relative frequency with which events have occurred in the past, although of the greatest value for many purposes, is utterly insignificant when compared with what may be called the *inverse* use of the same.

The *direct* use of extended tables, carefully and fully compiled, will show what *has been*, and, by consequence, what is *likely to be*. It will enable us to infer, with greater or less exactness, the probabilities of the future from the actualities of the past. It will show, for example, what diseases are on the increase or what on the decrease, and the probabilities of death from each; what the proportionate number of the insane or of the criminals of different classes now is, and, under a similar condition of society, probably will be; perhaps what proportion of the latter are educated or uneducated, and the crimes peculiar to each. But the *inverse* use ought to subserve a purpose far higher; for, if rightly conducted, it will enable us to come to some clue as to what part of the phenomena are true causes and what merely accidental accompaniments, and thereby direct us where to look for the influences which are to be controlled, in order that disease itself may be lessened and crime reduced. It is only by the most careful and conscientious compilation of vital statistics in the first place, and subsequent intercomparison and discussion of these, that any safe conclusions can be reached. *The experience of single individuals is liable to be misleading, however extensive;* for we often see that the inferences drawn from the experience of one are quite counterbalanced by the conflicting experience of another, who has observed under widely different circumstances as to time or place. It is only by multiplying indefinitely the number of individual instances, and varying greatly the circumstances of observation, that we can be safe. No fact in physical science is more clearly made out than that different observers have a different bias in observing the same event. One observes too soon, another too late; one sees to the right, another to the left. Training merely makes the error *regular*, but does not remove it. The results of different observers, [illegible], with dif-

ferent instruments, or with the same instruments in different positions, must be combined in order to get the most probable results. *And this is always done in deducing results of importance in the physical sciences.* How much more ought it be done in deducing results which are of such importance to the future welfare, development, and even existence of human society. Few individuals, however, are able to spare either the time or the money necessary for the collection of extensive and apparently isolated phenomena *of any kind.* Very often they get but little sympathy or encouragement in so doing. The first systematic observation of meteors met with but very little encouragement, and for a long time bore very little fruit. Nothing seemed more unsatisfactory or hopeless of results, than to watch and record the evanescent lights that flit across the sky and then are gone forever. But the connection between cometary orbits and the orbits of meteors, pointed out by Schiaparelli, and others, whereby the comet is regarded as the body from whose dissolution the stream of meteors is formed, would have been impossible to discover without these seemingly trivial preliminary observations faithfully recorded. So, also, nothing seemed more unpromising at first than the meteorological records, kept only by a few, who were looked upon rather as visionary enthusiasts, than as sober men of science, seeking for tangible and practical results; but the laws of storms and the storm-signal service are a permanent monument to the memory of these early and self-denying workers. In all the history of science a Tycho precedes Kepler, and a Kepler precedes Newton. First come the gatherers of facts; after them the deducers of laws. The functions and work of the one are as important as those of the other. Very rarely are they blended in the same individual. It is the duty of every community to know all that pertains to its own growth and development or even to its possible decay. And it is bound, by the mere principles of self-interest and economy, to establish such a system of registration of all vital statistics of any importance, as shall enable it, both for the present and the future, to know its own life-history, and the influences that are moulding it for better or for worse as the years pass on.

ABSTRACT OF THE PROCEEDINGS OF THE FIFTH ANNUAL SESSION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

By J. T. REEVE, M. D., of Appleton.
Member of the State Board of Health.

The American Public Health Association is a voluntary organization of sanitarians for comparison of views, for the study of preventive medicine, for concerted action in disseminating sanitary knowledge, and for the practical application of Public Hygiene.

Organized in 1872, its members have been elected "with special reference to acknowledged interest" in public health matters, and it has received the cordial support, and the thoughtful contributions of the most able laborers in the field of State Medicine. Its beneficient influence in the promulgation of sanitary knowledge has been widely felt, and the published volumes of its reports and papers are among the richest contributions to sanitary literature, covering, as they do, a wide range of the most practical questions of Individual and Public Hygiene and of the relations of these to education, to culture and to morality.

These volumes, three in number, contain the most important of the papers presented at the first four meetings of the Association. In its fifth annual session, it was the privilege of the writer to participate, and the following brief abstract of some of the more important of the papers presented has been prepared at the request of other members of the Board who were also in attendance,* as illustrative of the wide variety and important character of the ques-

* Drs. Griffin and Marks and General Bintliff.

tions which are being discussed, and in the hope that it may be not without value in its influence upon those who are interested in the sanitary work of this state.

ADDRESS OF WELCOME.

This session was held in Chicago, on the 25th, 26th and 27th of September, 1877 (Dr. J. H. Rauch, of Chicago, President, Dr. Elisha Harris, of New York, Secretary), and was opened by Hon. Wirt Dexter, who in delivering an Address of Welcome, alluded to the general and almost universal indifference of the people to the problems of public health. The loss of a few millions of dollars by the failure of some of her savings banks was convulsing Chicago to its centre, while unnoticed and unheeded, many times as many millions, were being as surely lost to the same community by neglect of sanitary laws, a loss permeating every grade of society. Men accepted these losses, as a matter of course, without commotion and almost without protest. Yet, upon the removal of unhealthy conditions, and upon the securing of the most healthful, rests the real and continuous prosperity of the city. Every man has a direct pecuniary interest in the health of his neighbor, and in the healthfulness of his surroundings. From a sanitary standpoint, man *is* his brother's keeper. The presence and prevalence of Contagious and Preventable Diseases result not only in unnecessary loss of life, but in loss of health and vigor to the living, in the decline of traffic, in diminished travel, and in many ways causes an immense pecuniary loss, it being shown that a single epidemic of small-pox cost the city of Philadelphia $21,000,000.

NATURAL CONDITIONS OF THE CITY OF CHICAGO.

This Address was followed by an Address from the President, in which the geologic, geographic and topographical conditions of the city of Chicago were discussed. The city is built upon what was evidently once a part of the bed of Lake Michigan. Its surface is nearly level, and its surroundings are low and marshy prairies. Its present level is from eight to twelve feet above the natural surface, yet, notwithstanding these natural disadvantages, a great city has grown here with marvelous rapidity. Its "rivers," once rivulets of a man's stride, have been excavated for commercial purposes, until they are capable of being traversed by great vessels. Into these

almost absolutely currentless canals, pours the sewerage of this immense population. Of course the sanitary problems attending such growth in the midst of such unfavorable natural conditions are complicated and difficult.

These problems were ably discussed in the

ADDRESS OF THE CITY ENGINEER,

who gave a detailed account of the drainage system of the city, including a description of the deepening of the Illinois and Michigan Canal, through which a current of lake-water is turned into the Illinois river at a point nearly one hundred miles distant, passing thence into the Mississippi, which for a time relieved and still measurably relieves the city of its sewerage and filth. Mr. Chesbrough also described the water-supply of the city, which is derived from the lake at a point two miles from the shore, and conveyed to the city through two tunnels, which lie from sixty to seventy feet below the surface of the lake, being pumped at the shore end to the height of one hundred and thirty feet. This water is regarded as of remarkable purity.

POLLUTION OF STREAMS.

Following this paper, Dr. Charles F. Folsom, Secretary of the State Board of Health of Massachusetts, discussed the sewerage question and the pollution of streams by sewerage and other refuse, pointing out the dangers arising therefrom, and the necessity for some stringent laws to prevent the befouling of streams and water courses from which supplies of drinking water for towns and cities are derived. The danger to health and life arising from such contamination was dwelt upon and corroborated by remarks from several other members of the Association, and the draft of a law forbidding or regulating the deposit of sewerage matter or other filth in streams, which had been prepared with reference to securing its passage in Massachusetts, was presented for criticism or suggestion. The law proposes to give to the State Board of Health large discretionary and regulating powers. It met with evident favor from the Association, and was commended to the favorable consideration of all State Boards of Health.

PROPOSED SANITARY SURVEY.

Dr. Harris, the Secretary of the Association, in presenting his

report, referred to the desirability of a Sanitary Survey of the United States, which should illustrate by accurate maps, the topography and hydrography of the whole country, with reference to the practical questions of sanitary drainage, and of the healthfulness of sites for towns and for residence. In this way the influence of stagnant waters, of swampy and marshy grounds, and of differences in elevation can be intelligently studied. The work was commended to all State and other Health Boards. Dr. Harris referred to the increasing interest felt in Sanitary Science, and to the advocacy of Public and Private Hygiene by the Press, the Pulpit and the Schoolmaster.

THE SANITARY GEOGRAPHY OF CONSUMPTION.

Prof. H. A. Johnson read a very able paper, giving the results of study into the Sanitary Geography of Consumption, discussing the relative prevalence of the disease in different parts of the country, deaths from consumption compared with deaths from other diseases, and the causes modifying the prevalence of the disease. The conclusions reached were, that while the general death-rate from all causes was diminishing in the United States, the death-rate from consumption was increasing. Some of the influences causing this were: — 1. The Origin of the Population. 2. Soil Moisture and Atmospheric Changes. 3. Density of Population. 4. Occupation and Mode of Living.

Dr. Gihon of the U. S. Navy added some interesting corroborative testimony of the influence of dampness, showing the great increase of Pulmonary Diseases, in leaky vessels, or in vessels where the decks were kept constantly damp, while on vessels where the decks were kept perfectly dry, these diseases were comparatively rare.

RELATION OF HYGIENE TO EDUCATION.

Two papers on allied topics were presented during the session, the one by Dr. J. M. Gregory, President of the Illinois Industrial University, "On the Relations of Hygiene to the Higher Education" obtained in Colleges and Universities, and the other by Dr. C. N. Hewitt, Secretary of the Minnesota State Board of Health, "On the Relations of Hygiene to the Lower Education" obtained in Common or Public Schools.

The importance of these problems can hardly be over-estimated.

Nominally one-third of the entire population of the country is in school, and inquiry into the influence of school-life and occupation upon the health of pupils is most wise. It was confidently asserted that the cause of the failure of the health of so many of our young men and women in schools and colleges is not because of study. Even severe study is not in itself harmful. The reverse of this was claimed to be true. Brain, like muscle, thrives under healthful exercise, but over-stimulation encouraged by the prize and marking system was condemned as goading on those already too active. Students lose health by close confinement in vitiated air with lack of physical exercise. A wide diffusion of knowledge on the subject of health through the school-teacher was strongly advocated. It is not simply the cramming of the mind with anatomical and physiological names that is desirable, but that the principles of practical hygiene should be taught to the youngest pupils in the common school, as well as to the more advanced students in the colleges. To this end suitable text-books should be introduced into them, and Hygienic Tracts and Health Manuals should be distributed.

REMOVAL AND DISPOSAL OF HUMAN EXCRETA.

Dr. Azel Ames presented an able paper On the Removal and Utilization of Domestic Excreta, in which the various systems in use were discussed, the writer declaring that in none of them was there sufficient attention paid to the utilization of the product, the problem being how to render its removal from the place of deposit, and its return to the soil which it should enrich, without offense and with profit.

PHYSICAL EDUCATION AND HYGIENE IN AMHERST COLLEGE.

The experience of the departments of Physical Education and Hygiene in Amherst College was the subject of a paper by Prof. Hitchcock of that institution, where since 1860, the physical culture of the students has been in charge of a special professor of this department, who is a regularly educated physician. For this purpose the Gymnasium is the class room and gymnastic exercise is obligatory; a prompt attendance and faithful discharge of this duty forming a part of the college standing of the students. The effect of this experiment was declared to be eminently satisfactory, having led to a higher physical development of the pupils, banishing some

forms of disease, notably dyspepsia, and diminishing invalidism. A brief paper was also presented by Dr. Coan, showing the benefits of physical training among female students as practiced in the Gymnasium, fitted for them at Ann Arbor.

CAUSATION AND PREVENTION OF EPIDEMIC DISEASE.

Prof. Lyman, of Chicago, in a highly scientific paper, discussed "The Present State of Exact Knowledge of the Causation and Prevention of Epidemic Diseases," exhibiting the difference between poison and infection, and treating with some detail of the different epidemic diseases and of the spread of contagion.

PUBLIC HEALTH AND PUBLIC HOLIDAYS.

One of the most popular of the papers presented was by the Rev. Brooke Herford, on "Public Health and Public Holidays," in which the lamentable absence of holidays or days of recreation in this country was forcibly presented. These holidays were declared to be safety-valves absolutely necessary for the over-worked brain and muscle of Americans. Incessant application begets a distaste for leisure until it has been said that "an American with a holiday is the most miserable of men." The high-pressure system produces prematurely old men with shattered nerves, and seriously complicates the problem of Public Health. The numerous holidays and the Saturday half-holidays of the English were commended as a worthy and rational example.

DESTRUCTION OF OFFENSIVE GASES.

Dr. DeWolf, Health Officer of Chicago, gave an interesting description of a new process of destroying the offensive gases from rendering tanks and fertilizing establishments, by which it was hoped a great nuisance and cause of mortality might be removed.

REGISTRATION.

A valuable and elaborate paper on the importance of securing uniformity and completeness in the Registration of Vital Statistics, was presented by Dr. Harris, the object being to secure completeness and uniformity of final returns, leaving the steps thereto to be varied as needed to meet the wants of different states or communities. The subject being one of universal interest, the paper was

ordered to be at once printed and referred to the State Boards of Health.

A very important paper was presented by Prof. Andrews, of Chicago, on

"THE SANITARY AND ECONOMICAL IMPORTANCE OF THE BEST SURGICAL AND MEDICAL TREATMENT OF THE NEEDY POOR,"

in which it was shown that the ranks of pauperism were largely augmented by disease, or by injuries which might have been prevented, or speedily cured by early and appropriate aid. Unable to procure, and failing to receive this aid, these unfortunates finally drift into permanent burdens on the community as inmates of almshouses. Economy and humanity alike demand the attention of the authorities to this subject. A few dollars judiciously expended, may save not only from expensive pauperism, but may save the man himself to useful citizenship.

INFANT MORTALITY.

An address by Prof. N. S. Davis, "On the Means of Diminishing Infant Mortality," was one of the most practical contributions to the Association, pregnant with the possibilities suggested by it. After referring to the excessive mortality of infantile life from bowel complaints, the Professor having made careful observations extending through a series of years, expressed the decided conviction that these diseases originated almost exclusively during those brief periods when there is excessively hot weather *continuing through the night as well as the day*, of which there are very few during the season. Sudden changes of weather seldom produced them; hot days with cool nights seldom produced them; though these conditions frequently aggravated such diseases. Particular attention was called to the fact that mothers and nurses frequently failed to note the beginnings of disease, dating only from the time when the sickness becomes noticeably severe, perhaps several days after the real commencement of the disease, during continued hot nights. The suggestions for prevention were exceedingly simple. If only infants can be saved during these few days and nights, a large part of the mortality from those diseases might be averted, but *the beginnings of the disease must be prevented.* If the children could have the benefit of floating hospitals, or a cooler climate,

it was well; but if these could not be had, let the sleeping-room be large and most thoroughly ventilated, and let the child's temperature be reduced and the nerve force increased by a cool bath, or by wet bandages.

It is proper to add that in this report no effort has been made to preserve the order in which the papers were presented, and that the report includes not all the papers that were read, but only such as were listened to by the writer. Of the various papers that were read by title or by abstract, no mention is made. Some of them are of great interest, and will doubtless be published, adding materially to the value of the Fourth Volume of the *Public Health Papers.*

EXTRACTS FROM THE COMMUNICATIONS

OF

CORRESPONDENTS.

NOTE.—The following extracts from the communications made to this office illustrate the spirit of its correspondence. and convey much information of sanitary interest. It is regretted that want of space has made it necessary to make these quotations undesirably brief in many cases, and to wholly omit some valued communications. The extracts are arranged alphabetically by towns.—SECRETARY.

Appleton.—No single disease has prevailed in this vicinity to any great extent during the year, except an epidemic of diphtheria of which the following is a brief history:

With the exception of a few isolated cases, this region had been entirely free from diphtheria since the subsidence of the great epidemic which swept through the state in 1862–64, until October, 1875. At this time it made its appearance in Buchanan, the township adjoining the city on the east and at a point some five miles distant from the city limits. From thence, after a short time, it spread northward into the town of Harrison. The type of the disease at its outbreak, and during the first weeks of its prevalence, was of an extremely violent and malignant character. In the majority of these earlier cases there were no prodromic systems, and the patients succumbed to the violence of the attack in periods varying from 24 to 72 hours. Subsequently the disease assumed a milder form and gradually disappeared from the section. In February, 1876, it first appeared in this city and has continued with more or less violence until now, although the number of cases during the past six months has been comparatively small. As in the adjoining to[illegible] made with great severity, but grad-

ually it became less violent in type, and the death rate was greatly diminished.

In May, 1876, however, when physicians were encouraged to hope for its complete subsidence, the complication of "diphtheritic croup" first appeared in very many cases. This form of the disease has never since entirely disappeared from the city and vicinity. According to the most complete information accessible, there have been in this city and in the country tributary to it, some 70 or 80 cases of this croupal character, nearly all of which have proved fatal. The majority of these cases have been among children of from two to seven years of age. In no instance has an adult been thus attacked.

Most authorities agree in considering "diphtheritic croup" a complication of diphtheria dependent upon excessive exudation in severe cases. The history of the present epidemic, however, has seemed to demonstrate a contrary opinion. In a very few instances only, the patients were already severely affected by diphtheria, previously to the onset of the croup, and in fully fifty per cent. of the cases the croup was itself *a priori* the affecting disease, and very often littleor no exudation was visible upon the faces or any other part of the throat.

In the latter part of November, 1876, diphtheria appeared in Greenville, the neighboring township on the west, where it prevailed for some months, thence worked further westward to the village of New London and vicinity. The general type of the disease was very similar to that in the localities previously visited. The epidemic is thus seen to have pursued a gradual but steady northwesterly course without any particular local causation which we have been able to trace. It is a noticeable fact, however, that the disease, both in city and country, has been confined very largely to the foreign population. It was also observed that many of the pupils of one of the city schools, whose sessions were held in a basement room not wholly free from dampness, were attacked by it. Also, while in many affected families the home hygienic influences were all that could be expected, still in a large percentage of cases lack of proper ventilation and cleanliness have, without doubt greatly influenced the spread of the disease.

There has been during the year a single case of small-pox, the origin of which was directly traceable to infection at Milwaukee. The city has for several years been provided with a pest-house and

to the prompt and complete isolation of such cases as have occurred from time to time, and to a thorough system of vaccination, is due its comparative immunity from the ravages of this terrible disease.

Bell Centre.—We have had an epidemic of scarlet fever, beginning about the first of January last and lasting until the present time. Being at first severe, it assumed a milder form and since then the mortality has been small, the sequelae giving the most trouble. We have had a few cases of remittent fever, and we generally have a good many cases of intermittent fevers along the sloughs and bayous of the Kickapoo river, which are the chief cause of sickness in this vicinity.

Benton.—My ride is in a good, rolling, farming country, drained by the Galena river and its tributaries, and watered abundantly by good springs. About three-fourths of the inhabitants of this section are farmers, one-fourth miners. I think the latter are not, as a class, less healthy than the former. Their principal diseases are asthma, chronic bronchitis, and rheumatism. The two former are caused by working in close mine "drifts" and inhaling dust and powder smoke. The latter from exposure to wet in water "diggings," and change of temperature, which, in winter, is often as great as × 70° below ground to — 10° or — 12° above. The miners seldom—almost never—suffer from lead disease, that being confined almost exclusively to workmen in furnaces. Typhoid fever prevails occasionally to an alarming extent in certain parts of this section caused by neglect of proper sanitary precautions in building and water supply. I frequently find families supplied from wells situated in yards in which cattle and hogs are fattening for market, and sufficient attention is not paid to the disposal of human excreta. It seems to be thought that it is sufficiently cared for so long as it is out of sight and produces no palpably disagreeable odor. I will mention a case in point: Two families lived in houses fifty yards apart, on the west slope of a hill, about twenty-five feet above the level of a narrow ravine. Neither house was supplied with a water closet, and both derived water from a spring situated near the more northerly house. In April, 1875, the mother of the family living in that house was confined, and afterwards suffered from fever. As she got better other members of the family, as well as persons living in the other house, sickened with typhoid fever. A boy, who worked in the field close by and slaked his thirst at the same spring,

stances, well housed, clothed and fed, very much better than the average.

Case 1st, was a robust, healthy boy, three years of age, who had never been sick. He was violently attacked with croup, October 20th, and died at the end of seventy-two hours.

Case 2nd. On the 25th of October, the youngest child, a girl of eighteen months, was taken in the same way as the first case, and ran exactly the same course, ending in death after sixty hours.

Case 3rd. At the time of the death of the second child, a little girl five years old was found to have all the premonitory symptoms except the patches of white membrane; after forty-eight hours she seemed convalescent, and ran about the house as any child would. At noon of November 12th, she was suddenly seized with a "spell of coughing," which rapidly developed into a fully formed case of croup. The breathing became more and more difficult until the third day, when she died exactly as the two first children did.

Case 4th. A boy, seven years old, was attacked November 1st, with what looked like diphtheria, the tonsils both being covered with patches of white material. At the end of seventy-two hours he was convalescent.

Case 5th. The next to the oldest child, a girl ten years old, had exactly the same symptoms as the seven year old boy, all the symptoms disappearing after three or four days.

Case 6th. The oldest, a boy of twelve years; had the same symptoms as cases 4 and 5, yet the membrane did not form in the throat. He recovered in four days.

In the history of the six cases herewith described (all in the same family), I think we have abundant proof that the disease was brought about by zymotic, or malarious causes, and from want of proper sanitary measures; and this conviction is perfect in this place. *All* join in saying that it was owing to the house and its surroundings. I am a firm believer that if perfect sanitary conditions had prevailed, the whole difficulty would have been avoided. The house is a story and a half frame upright, and with surrounding additions which prevent perfect circulation of fresh air. The cellar is under only a portion of the house, is damp, and smells mouldy. Under all the additions there is no cellar. The house is raised about eight or ten inches from the ground on a close rock foundation or underpinning. The yard is very flat, and a place where water

settles every time we have a heavy rain, or the snow goes off in the spring (a regular mud-puddle). On the east is a large lumber yard, piled as high as the house, where the lumber is allowed to dry after being floated down the Wisconsin river from the pineries. On the north side are the stables belonging to the house, with the stables and yards of the lumber company. On the west is an open lot of vacant land, too low to be suitable for building purposes, and covered with decaying weeds, ponds of stagnant water that dry up during the hot weather, and where all the "wash" for a long distance around settles, after being brought here by the natural lay of the surrounding higher land, and by the help of several ditches used to drain off the surface water from barns, stores, etc. On the south is the road, on the north side of which and directly in front of the house, is a ditch that is always full of water drained off from the places above described. After the death of the second child, the house was "fumigated," and bromo-chloralum used in it as a disinfectant. The people of this place could not be thoroughly aroused to the necessity of sanitary supervision until I got a chance to talk about these cases, and now they are determined to have this place drained by the city, carrying the water off half a mile or so into a slough.

Chippewa Falls.—An epidemic of cholera infantum, commencing in the summer of 1876, extended through the months of September, October, and part of November. Remittent and continued fevers, of a severe type with typhoid symptoms, prevailed during September, diminishing to November. Three deaths, from what was called diphtheria, occurred in Cook's Valley during the fall. Cholera infantum prevailed during the last summer, but few cases proved fatal. Cholera morbus, or endemic cholera, was more prevalent than usual, two cases proving fatal. A peculiar sequel of these troubles has been gastric and visceral irritation, lasting two or three weeks. In the last part of September, remittent fever made its appearance, complicated with cerebro spinal symptoms. Cholera infantum prevails to a much greater extent in the city of Chippewa Falls than elsewhere in the county. The general decrease in the severity of zymotic diseases is due to the dryness of the season, thereby preventing the formation of the germs necessary to the contamination of the system.

The chief sources of danger to the health of this county are:

1st. The utter want of sanitary knowledge of the people. Many of the physicians, even, ridiculing efforts to disseminate sanitary knowledge. 2d. Want of drainage and sewerage. 3d. Want of cleanliness. 4th. The general absence of pure water for drinking purposes.

Douglas Centre.—The most prevalent diseases here are fever, diarrhœa and dysentery, in the order named. Intermittents are very rare. The fevers begin as remittent, and sometimes continued, terminating in typhoid symptoms at the end of a week or ten days, if neglected. There are many marshes in this neighborhood, which are alternately water-soaked and dry and hard. The country is now much healthier than at its first settlement, twenty-five years ago. A dam was then built at Briggsville, making the largest of the three mill ponds in this vicinity. I could distinctly trace its effects in aggravating and increasing disease for eight years after its building, within a distance of three miles all around the pond. Bit by bit, very slowly the marshes get drained, especially at their edges, and this may be one of the causes of the diminished sickness observed of late years.

The location of the school houses is good, on well drained land, but they are badly ventilated. An undue number of teachers and scholars come to me for medicine at the end of the school terms, suffering from confinement in overheated rooms.

Green Bay.—Measles of a mild type has been the one prevailing epidemic for the past year. A few cases of diphtheria of severe type have occurred. In one family of seven all were taken with this disease. The first three cases were fatal. The others were seriously sick. Under the woodshed of the house where these patients lived (the door of the shed opening into the kitchen), I discovered a drain, into which all the house slops of every kind were thrown. The drain was made of rough boards, covered, and extended a few rods into the adjoining garden, where its contents were discharged. The gases from it found easy escape at its entrance, near the kitchen door. There was also, under the house, standing water, which must have been contaminated by the leakage from the drain. I believe that the foul gases, generated in this drain, were the cause, if not of the diphtheria, at least of its severity.

The school houses in this city are well lighted and warmed, but not well ventilated. I believe that any system of ventilation that

has not heated flues or machinery to aid it, is, in winter weather, when most needed, a total failure.

I would respectfully call the attention of your Board to the fact that the school desks in this city and, probably, throughout the state, are so arranged, in relation to the seats, that the eye of the pupil strikes the book at an obtuse angle. Hence, there is a disposition on the part of the pupil to lean forward over the desk, rather than tiresomely to hold the book at a right angle with the line of vision. I believe it is an acknowledged fact that that the least damage to the eye is sustained under close application, where this angle is maintained with the book at a proper distance. It is also a self evident fact, that the pupil should sit erect, or nearly so, during study hours. I believe there is one remedy for both of these evils, inexpensive and easy of application, which should be strongly urged. Namely, an adjustable book rack, or support, attached to and, perhaps, forming a part of the top of the desk, so arranged, that, when let down, the surface of the desk shall be smooth. An arrangement of this kind was exhibited at the Teachers' State Convention held in this city within the last year.

Hammond.—Eight cases of typhoid fever recently occurred in Baldwin in this county, which seem to be clearly traceable to accumulated filth and contaminated water supply. The prairies in this vicinity are poorly watered, having no springs and with wells from 75 to 200 feet in depth, many of which fail in dry seasons, compelling the hauling of water from long distances. The majority of intestinal diseases this past summer have been readily traced to the use of water which has been thus hauled in barrels and allowed to stand from 24 to 48 hours before being replenished. The inhabitants of the prairie are, however, on the whole much healthier than their neighbors in the timber, a part of whom are poorly fed and clothed. Many of the school-houses in this vicinity are sources of pulmonary disease from lack of ventilation and imperfect heating.

Hazel Green.—The water-supply of this village is almost entirely from cisterns without efficient filters, to which source some intestinal diseases coming under my observation can be clearly traced.

The majority of our schoolhouses are too small and without special appliances for ventilation, and I have frequently been consulted

by persons whose children complained of headaches and dizziness whenever they attended school. The heating in most instances is very uneven, some children suffering from heat while others are shivering with cold. The older and stronger, during recess, crowd out the smaller from getting warm. If the schools had a cellar below, with a furnace and registers, there would be better and more even warmth and less danger from fire.

This section was visited by an extensive epidemic of scarlet fever in 1875–6, in some cases of great malignancy, one family losing ten out of eleven children. I could trace the progress of the disease in many cases with perfect ease, in its dissemination by means of crowded funerals and busybody interference.

Kilbourn City.— The diseases most prevalent in this county during the past year were diphtheria, scarlet fever, typhoid and typho-malarial fever, dysentery, small-pox and pneumonia. I should state the local causes of disease to be filthy alleys, stagnant pools of water in the streets and improper water for drinking and culinary purposes. Too often the water in wells is contaminated by surface water and drainage from the house and barnyards. For example, last May I attended a family consisting of husband, wife and five children, all sick with diphtheria. There had been no known exposure to the disease. On investigation I found that the well from which all their water was obtained was so situated as to be undoubtedly contaminated by the barnyard. The mother remarked that she did not believe the water was good, for as soon as the ground thawed in the spring it looked and tasted very badly. Good and pure water was after this obtained from another source, when they all began to get well and recovered with but little medication. The family discontinued the use of the water until hop-picking time when they, together with many of their employees, began using it again and persisted in it until the mother became prostrated with fever. I pointed out to them the poisonous qualities of the water and again interdicted its use.

Since commencing this report, diphtheria in an aggravated and malignant form has appeared in a family of six; two of the children have died. On investigation, I found that the family had been picking hops at the above named place, and I have no doubt that they were either poisoned by the water or that they brought the germs of disease from the family they were picking hops for, or

both conjoined. I give you the facts, and to say that sickness is not ys produced in this way is simply to say that the circumstances of its development are not always present. The germs of disease find a suitable soil in one place and not in another.

Kilbourn City is situated on the east bank of the Wisconsin river, and a more healthy place for a city cannot be found in this section. It is made up largely of a foreign population, who will not keep clean in person or about their premises. I am satisfied that many cases of sickness might be prevented if the proper authority could be made to act as it should, and as the law provides for. Within the last ten years large tracts of marsh have been drained, and scarcely a case of fever now prevails where previously autumnal fevers and dysentery of a typho-malarial type were very prevalent. The school-houses are illy-constructed, illy-ventilated, poorly lighted and the outside accommodations are neglected. I think many cases of sickness have their origin in the school-room.

La Crosse.—During 1877 there occurred in this vicinity an epidemic of scarlet fever not malignant in form, although generally severe, and proving fatal most often where the sanitary surroundings were bad. A larger number of adults contracted the disease than was ever known before in the history of the city. Whooping cough and measles prevailed at the same time, and the effect of these three diseases among children was such as to reduce the attendance of school children in some rooms 75 per cent. Early in February the City Board of Health adopted measures to enforce the law relative to contagious diseases, requiring all such cases to be reported to the Board. No very energetic action was taken, but the mere fact that the disease was noticed by the Health Officer secured greater care in the isolation of the sick and more thorough disinfection after the extinction of the disease in a household. The plain, practical and valuable suggestions of the State Board were adopted early in April and reprinted for distribution here. Especial efforts were made to place a copy in the hands of every family.

During the summer the city was free from any disease that could be attributed to local causes until the middle of August, when a few cases of typhoid fever were noticed. Up to September 1st, these cases have not been numerous or severe in type.

It is perhaps worthy of notice that during the cholera epidemic of 1873 nine cases occurred in this city. No mention of this is made by Dr. Woodworth in his history of the epidemic, but as reports from Davenport, Iowa, show that the disease was discovered there about the same time, and we are in constant intercourse with that port and with St. Louis, our cases were undoubtedly developed from communication with those points.

Our school buildings are well lighted, heated, and have good means of escape in case of fire; but the ventilation is entirely inadequate, and that impairment of the mental and physical energies of those subjected to such impure air must result, is too self-evident to require comment. One building constructed last summer should be excepted, as it is provided with the Rattan system of heating and ventilation, which approximates perfection when under the supervision of careful and intelligent teachers.

In the basement of the city buildings there are a number of cells which were used for the confinement of city prisoners for a number of years. After repeated condemnation in the reports of the secretary of the State Board of Charities and Reform, it was abandoned as a place of confinement, and all persons are now provided for in the county jail. Between the two places, however, in a sanitary point of view, there is but little difference. The jail is not ventilated, and despite the utmost care of the officers in charge, is a foul place, unfit for the confinement of criminals, and receives deserved condemnation from visitors as well as occupants.

Medford.— Twelve cases of malignant diphtheria occurred in this vicinity with six deaths. The families were living in two small log houses, on a low, marshy piece of ground, eating salt food, living in dirt and filth, and using very foul water obtained from a hole in the ground, only four feet in depth. There were no other cases in town.

Menasha.— During the year ending September 1877, the city of Menasha was visited by an epidemic of small pox, extending from December, 1876, to May, 1877, assuming in progress a severe form. During that period about seventy cases occurred, with a proportion of deaths of nearly one to six. From May to December several more cases were reported, but no deaths, most of the cases assuming a mild form. *The epidemic originated in the paper mills at Neenah, and the cases occurring in Menasha all sprung directly*

or indirectly from that source. The first two cases that came under the care of a physician fell into my hands. They were young women, eighteen or twenty years of age, who had been working in one of the paper mills at Neenah, and had never been vaccinated.

Had the proprietors of the mills been more thorough in enforcing vaccination among their employees, I am certain the epidemic would not have been so widespread. So late as the 25th of April, I attended a case that originated in one of the mills. The patient had worked there two months or more without being vaccinated.

During the winter months we had also an epidemic of scarlatina, the onset of which was quite severe. Several fatal cases occurred during the fore part of the epidemic, but, as spring advanced, the severity diminished. During the warm months quite a number of cases were reported, but were not seen by physicians, except as they were followed by some of the sequelae of the disease.

Necedah.—I have examined specimens of water taken from a number of the wells of this village, which are on the premises of the families in which I practice, and I find that my largest bills almost invariably belong where the water is poor.

A number of cases of typhoid fever occurred in this place in the fall of 1876, which were mostly in the vicinity of a certain pond and soon after the water was drawn off from it.

Neenah.— In this vicinity the year ending September 1st, 1877, has been remarkable from a sanitary standpoint, from the prevalence of epidemics of small pox and scarlatina of unusual length and severity. Beginning in November, of 1876, simultaneously in this city and Menasha, small pox continued, with short periods of intermission, through the winter and well into warm weather, in the spring. During this time there were, in this city, some twenty unmistakable cases, the mortality being light, while in the neighboring city of Menasha, the number of cases is estimated at sixty, with a much larger proportion of fatal cases.

In both places the original and principal source of infection was the paper mills.

In view of these facts, it must seem, even to the laity, as if some special legislation should be had, compelling the thorough disinfection of paper stock before allowing it to come to the mills for assortment.

Scarlet fever appeared in this city in mid-winter. It had been

prevailing west of us since autumn. I estimate the number of cases here to have been from seventy to eighty, the last occurring in July. The mortality was about 12 per cent. There were no restrictions imposed by the city authorities, but the judicious counsel of physicians did much to prevent the more general spread of the disease. No thorough system of disinfection was practical, and all kinds of so-called preventive treatment were found to be ineffectual.

Some of the fatal cases showed symptoms of peculiar malignancy, but most of the deaths that occurred were the result of some of the various sequelæ of the disease.

Oshkosh.— The diseases which prevailed here during the past year have been chiefly bilious andremitting fevers, assuming a typhoid condition as they progressed, catarrhal and lung troubles, rheumatism and bowel complanits. There has been an extensive prevalence of whooping cough, a few cases each of scarlet fever, of measles, and of diphtheria.

Two years ago several cases of diphtheria occurred in a family living in Algoma, under the following circumstances: The drain for the house refuse opened and received its filth underneath a sink, which was located in a room used as dining room and kitchen in winter, and dining room in summer. It extended three or four rods from the house, and was supposed to come to the surface. It became clogged, the soil became permeated with its contents, and the result was three cases of diphtheria in the family, with one death, the other two barely escaping. Another case occurred within a month. One of their neighbors, a young man who went to assist them in their distress, took the disease, barely lived through the attack, carried it to his home, where six others sickened with it, and two died. From them it was contracted by another family, where there were seven cases of illness, with one death. A servant girl, who lived in the first mentioned family, died also. One of the greatest needs of this vicinity is a better system of drainage about the habitations of the poor.

Prairie du Chien —During the winter of 1876–7, and the spring months of 1877, an epidemic of scarlet fever and diphtheria prevailed pretty generally through Crawford county. In the northeastern portion of the county, its type was severe, in other parts of the county much milder.

Aside from this epidemic, there has been but little disease, except on the borders of streams, where malarial fevers have prevailed to some extent.

The school houses are mostly badly constructed and ventilated. The vitality of teachers and scholars is badly depressed, and in the late months of winter bronchial catarrh and pneumonia are frequent with them.

Richland Centre.—Diphtheria has prevailed as an epidemic for two or three years, principally in the valley and vicinity of the west branch of Pine river, in the northwest part of the county, and the vicinity of the mouth or outlets of Pine river, Mill creek, and Knapp's creek.

Ripon.—Scarlet fever is the disease that has been most prevalent in this vicinity. Mild for the most part, it differed in different localities, and, notably, in different nationalities. In the city and town of Ripon it has been mild. In the western portion of the town of Rosendale it was very severe. In the southern part of the town of Nepeuskun the type was generally mild. The severe and malignant cases were confined almostly entirely to German and Polish families in the districts of which I speak.

In my opinion, this fact was due to the criminal carelessness regarding exposure to the disease, and to improper sanitary regulations. In spite of expostulations, these families generally insisted on having a large funeral in case of death, and frequently from the house where a patient was then lying sick of the same disease. A considerable portion of the cases of scarlet fever were followed by dropsies, general or local.

The belief is general among some classes of foreigners, that this disease is not contagious or infectious. In my opinion, it would be wise to publish the circulars of the board, concerning eruptive fevers, in different languages, and to take means to have them distributed so widely that they should reach every family.

Rosendale.—In this vicinity is the height of land or watershed separating the waters flowing into the two Gulfs, St. Lawrence and Mexico. The marsh here is mostly in the character of peat, and some of it has been worked and burned for fuel. In many places in these marshes there are springs, some of clear, beautiful, hard water, and abundant in its flow. In the early settlement of the county, water was mainly obtained from these springs for family

use, and often carried in barrels, and renewed at long intervals. The county is now pretty well supplied with wells, many of them drilled into the rock, which, upon an average, may be stated to be thirty feet in depth. The water is all of it hard.

In the early settlément of the town, typhoid fever was rife, but since the draining of the marshes, and the supply of water from the wells, there has been but little. This has been effected mainly, in my opinion, by the change from springs, contaminated by surface water and other impurities, to well-arranged wells.

Theresa.—In September, 1876, a violent form of typhoid fever occurred in the house of a farmer in the town of Lomira, affecting four members. The disease broke out soon after the removal of a stable which for years had stood fifteen feet from the family well. The soil of the yard is a sandy loam, with a clay subsoil, and this soil was so saturated, that to the depth of four feet, it had a fetid odor. The whole yard is on a side hill, the privy being on the upper side of the house. In addition to this, the cellar of the house was entirely unventilated, shallow, and terribly foul, and the walls of the house were damp and mouldy. The well-water contained large quantities of organic matter; but this well was used only for culinary purposes, the supply for drinking coming from a pure spring. I believe that in this case the foul cellar, the damp, mouldy walls, and the soil putridity, were the direct cause of the outbreak. There were no other cases of typhoid fever in this vicinity.

Waterloo.—An epidemic of scarlet fever broke out in this vicinity in October, 1876, and continued with increasing severity until the middle of March, 1877, from which time it began to decline, disappearing in the following May. The number of cases occurring in this time was nearly 300, with a death rate of 10 per cent. Some facts bearing on the dissemination of the scarlatinal poison observed by me are of interest. The first case, under my notice, occurred in a young girl three days after exposure to the disease. A few days subsequently the disease broke out in a family three miles distant, affecting five children, the circumstances being such as to leave no doubt but that a boy living in the family, who had visited the first case, was the conveyor of the contagion. A call from the father of this family at a tavern two miles distant was, in turn, followed by an outbreak of the disease in the family of the tavern-keeper. The disease, up to this time, had been mild, but

now assuming more severity, measures were taken to isolate the sick, which seemed to limit the spread of the disease and lessen in a marked degree the number of cases.

The outbreak of the disease in the village was clearly traceable to contagion, the first cases occurring in families visited by the physicians in attendance upon cases in the infected locality outside of the town. In one notable case, a physician in attendance on scarlet fever cases was called to attend a case of labor in a locality in which, up to that time, no scarlet fever had appeared. In the family there was an only child which, five days afterwards, was taken sick with scarlet fever, and the mother, being attacked with puerperal peritonitis, died. No other cases occurred in the neighborhood.

Throughout the epidemic there was no evidence of the spread of the disease in any other way than by direct or indirect exposure to the contagion, or, in other words, that its spread was in any way through atmospheric influences.

The importance of ventilation was forcibly illustrated in the greater prevalence and more malignant type of the disease during such time as the weather compelled the closing of the houses. Two cases bear upon the duration of the vitality of scarlatinal poison. In the one case, a child, coming to live with a family who seven months before had suffered from the disease, became affected with it in a week. In another case, the poison had remained latent five months.

Waterloo, 2d correspondent.— In addition to about 300 cases of scarlet fever, there have occurred in this vicinity, during its prevalence, several cases of puerperal peritonitis. There have also been about ten cases of diphtheria, fifteen cases of dysentery, and twenty-three cases of pneumonia. There are in this neighborhood extensive low marshes and sluggish streams of water. Our school houses are generally constructed with no reference to ventilation, and this structure applies to our high school building. I have had several cases of sickness to treat, caused by exposure in this building.

Watertown.—In proportion to the number of inhabitants, the city of Watertown has been much more free from contagious diseases than the adjacent country, and the fatality in the city has been much less in proportion to the number attacked. I think this may

be accounted for, in the greater part, by the promptness of attention from physicians and a better class of nurses. This is especially so in croup and diphtheria. In many cases, scarlet fever and diphtheria have been combined; and, again, immediately followed each other. We have been remarkably free from typhoid fever. Bettor artificial drainage is all we need, and the prevention of the emptying of the same into an immediate river, from which is gathered the ice crop of every winter for the manufacture of beer and the use of our inhabitanss.

Wausau.—We have had no kind of epidemic for the past year. For the five years preceding we had scarlet fever on our hands, breaking out at different points, now in the city and then in the country. It was quite severe at first, but soon faded into the mildest form and has finally disappeared. In the winter and spring of 1873 cerebro spinal meningitis appeared and was very fatal among the poorer classes, especially in the country. Sporadic cases have appeared every year since, until last year.

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PUBLIC DOCUMENT.] [No. 20.

THIRD

ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF WISCONSIN,

FOR THE

YEAR ENDING DECEMBER 31, 1878.

ACADEMY LIBRARY OF MEDICINE

MADISON, WIS.:
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GENERAL REPORT OF THE BOARD.

STATE OF WISCONSIN,
Office of the State Board of Health,
December 31, 1878.

His Excellency, WILLIAM E. SMITH,
Governor of Wisconsin:

SIR: In accordance with the law under which the State Board of Health was organized, its third annual report is herewith presented.

In an accompanying report from the secretary of the board, there has been given an account of the chief measures which have been taken in pursuance of the object for which the board was constituted, and to that report in connection with this general one, you are respectfully referred, for information as to the details of its operations.

Nothing can be more true than that the state has a vital interest in the vigor and healthfulness of her citizens. A community lacking health, must of necessity be an impoverished community, and we invite especial attention to that part of the secretary's report in which the reports of local health boards are discussed, and the immense loss to the state resulting from diseases believed to be preventable, shown. There is no reason whatever to doubt that a large part of this great loss might have been prevented, had proper hygienic measures been taken, and the precautions observed which modern sanitary science has proven efficacious wherever they have been scrupulously observed. In this view, it will be noticed that the far greater evils of suffering and sorrow, which are inevitable accompaniments of sickness and death, are not considered, for upon these no valuation in money can be placed, and for them no pecuniary compensation can be considered an atonement.

General Report of the Board.

THE SPECIAL WORK

that has been entrusted to this board, which includes "a general supervision of the interests of the health and life of the citizens of the state, of making sanitary investigations and inquiries into the cause of disease, and the gathering proper information for diffusion among the people," is one which demands the most earnest efforts of the best minds in the commonwealth. In endeavoring to perform it to the best of their ability, the members of the board have sought the aid of men outside of their own number, who, either through practical experience or special study, were qualified to give such instruction upon various points as was contemplated by the law. It gives them great pleasure to say that their requests for assistance have nearly always met with hearty responses from those to whom they were addressed, and that the present report is, as a consequence, enriched by valuable contributions obtained in this manner which are worthy of careful study.

In addition to the material thus obtained, each member of the board has been charged, as heretofore, with the investigation of some one or more matters of interest and importance as regards the health of the people of the state, some of the results of which studies are given hereafter.

A matter of deep interest to this board, and one on which the people of Wisconsin are to be congratulated, is the growing interest in matters pertaining to sanitary science, of which evidence is given in the secretary's report, and in the extracts from the special correspondence. Nor is this interest confined to our own state; at the present time, no less than nineteen states of the Union have enacted laws under which State Boards of Health have been organized, and have entered upon their great and highly important work under auspices more or less favorable. The number of these State Boards is now more than double what it was at the beginning of 1876, and it seems possible that the close of the present decade will see few, if any, members of the Union in which the subject of state medicine will not be carefully studied, under the authority of the various legislative bodies. More than this, there is at present a growing feeling, intensified and stimulated, no doubt, by the re-

membrance of the fearful calamity which has so recently devastated a large part of our country, which favors the establishment of a *national public health organization*. A memorial has already been presented to the national legislature from the American Public Health Association, urging the immediate appointment of a "Provisional National Health Commission," preparatory to an organization such as that above referred to, from which memorial we make the following extract:

"We are entirely convinced that the future of public hygiene in this country depends mainly upon the proper organization of state and local boards of health, and upon such recognition of their importance and utility by the people and their legislators, that the necessary means and powers shall be granted to them which will enable them properly to perform their duties. Such boards can do good work, not only for their own localities but for the nation."

In obedience to the law which directs that this board shall make sanitary investigations and inquiries respecting the causes of disease and mortality, and "the effects of localities, employments, conditions, habits and circumstances on the health of the people," it has during the past year officially investigated the sanitary conditions of what is known as the Crawfish Valley, in the counties of Jefferson and Dodge. The publicity which has been given to this act, makes it proper that special mention thereof should be made in this report to your excellency, and that the conclusions at which this board has unanimously arrived after a careful study of the evidence collected, should be stated.

The investigation was made at the request of a large number of the residents of that region, 145 of whom, including citizens and officials of the towns of Milford, Shields, Portland and Lowell, signed petitions, one of which was presented from each of the towns named, asking that such an investigation be made.

These petitioners alleged that an excessive amount of sickness, due, in their opinion, to the overflowage of lands caused by a mill-dam erected on the Crawfish river, at Milford, prevailed in the region referred to. This board, having first sought to obtain all available information concerning the history and sanitary conditions of the country by means of correspondence and conference

with physicians and other citizens, including the proprietors of the mill-dam in question, afterward, by a majority of its members, made a personal sanitary investigation of the district embracing the vicinity of the Crawfish river, in the lower part of Dodge and the upper part of Jefferson counties.

The Crawfish Valley may be briefly described as an exceedingly level tract of country many miles in length, traversed by a tortuous and sluggish stream, the Crawfish river, which, rising in the southeastern part of Columbia county, soon enters Dodge county, near the southern boundary of which it receives the Beaver Dam river; it then passes into Jefferson county, where it finally empties into Rock river, thus affording the natural and only drainage for a section of country embracing at least eight or ten townships.

For perhaps a mile above the dam referred to by the petitioners, the river passes through highlands, and has well defined and somewhat bold banks; for four or five miles further, the eastern bank of the stream is generally fairly elevated, while that on the west is very low. From this point northward for several miles, the land on both sides of the river is flat and marshy, and much of it is too nearly on a dead level for the unaided eye to detect any deviation therefrom. This description applies to a tract varying in width from comparatively narrow limits at the south to wide marshes as one goes northward. The movement of the water through a large part of this tract is so sluggish as to be scarcely discernible; to the northward there is an extensive body of "floating bog," portions of which are from time to time detached and driven, as the winds may favor, until they find new places of lodgment, thus causing additional obstruction to the flowage and tending to the establishment of new channels. In many cases, the boundaries of the stream are wholly lost in overflowed lands, which support only growths of rushes, wild rice, and other aquatic plants. In other places, probably to the extent of thousands of acres, the level of the ground water is so near to the surface that the land is capable of yielding only a harvest of coarse and nearly valueless grass. The flat land usually terminates quite abruptly at the foot of the higher grounds on either side.

In seeking for the facts in regard to the sanitary condition of this

country, the board has been met not only with vague and uncertain statements, but also with assertions wholly irreconcilable with each other, made by both physicians and unprofessional men. Thus some of the oldest and most prominent physicians in that vicinity assert that "there has been no more sickness and no sickness of a different type, and no larger mortality along the Crawfish river for the last thirty years than in the adjacent country," and that it is comparatively free from malarial disease. Others, and these most immediately in contact with the region, declare that while there are few distinct outbreaks of malarial disease, the tendency of all diseases is to assume either an intermittent or a remittent type, and that such tendency seriously complicates the treatment of diseases otherwise easy of management. They also affirm that certain inflammatory affections prevail, one of them stating that for several years past all epidemics which have occurred in that section of the country have been most severe in the vicinity of these low lands.

These latter statements are in accordance with the common conclusions of observant physicians in respect to the unhealthful influence of low marshy grounds, both in this country and abroad, and they are such as the appearance of the section under discussion would justify us in anticipating, and yet, after the most careful examination of the records of sickness exhibited by the petitioners, and of all facts bearing upon the subject that could be otherwise obtained, this board has not found that there has been what in its opinion can justly be considered an excessive amount of sickness or any very unusual mortality.

The board is, however, unable to reach any opinion that is wholly conclusive, as in the absence of carefully collected vital statistics extending through a series of years, there are no wholly trustworthy data upon which to found conclusions. It is unquestionably true that some houses are in dangerous proximity to these marshes, and are so situated that they can have neither proper house drainage or safe water supply, and that in the attempt to cultivate portions of this marshy ground the citizens making such efforts are subject to exposures which are highly prejudicial to health. But the board find two facts that need to be taken into consideration, which tend

and the channels through which its germs find entrance into the human system, are clearly shown. The necessity for the exercise of caution in digging wells, and for so choosing their location as to render the contamination of the water supply impossible, is enforced by striking instances, and the need of keeping cellars dry, clean and well ventilated placed in a strong light. The unsanitary conditions of many dwelling houses and of their surroundings are mentioned, and shown to be the immediate causes of the outbreak of the disorder in many cases.

Intimately connected with all healthful life is the character of the soil on which we reside, and the subject of

LAND DRAINAGE, AND THE OBSTRUCTION OF WATER COURSES,

upon which Dr. J. T. Reeve has written, is therefore one of practical interest. Very little attention has hitherto been called to this subject in this state, though it is one which is attracting great attention elsewhere. Dr. Reeve has shown that land drainage is both profitable and healthful, and that these two interests seldom, if ever, conflict with each other. This paper shows the necessity for the drainage of dwelling sites, and that life upon a soil that is saturated or that holds water in excess is never safe — and it contains some suggestions concerning the evils which may arise from interference with nature's methods of drainage by the obstruction of rivers and other water courses, which are commended to the attention of legislators.

Dr. Walter Kempster, of the Northern Hospital for the Insane, contributes an article on

SOME OF THE PREVENTABLE CAUSES OF INSANITY.

The various phases of mental disease from which no age, or occupation, or station in life, is altogether exempt, its causes, and the methods best adapted for its cure, have engaged the special attention of many of the most thoughtful minds, more particularly in recent years, and the question of how to avoid this worst calamity of human life, is one that cannot fail to be of universal interest. That this calamity can be prevented in a large percentage of cases, "by individual effort, by wise and wholesome laws, and by a proper-

training of the mental faculties," is asserted by the writer, and his hints and suggestions are commended to the careful attention of all who desire to preserve that chiefest of all earthly blessings, a sound and vigorous mind in a sound and healthy body.

Prof. Anderson, of the State University, has written a brief but suggestive article upon

THE INFLUENCE OF READING UPON HEALTH.

Almost everyone knows from personal experience how powerfully the mind affects the body in many ways, but comparatively few recognize the fact that the conditions of mind produced by reading works of fiction, addressed in great part to the passions and the imagination, have the powerful influence in this direction which they really possess. Prof. Anderson has done good service in calling attention to this fact, and in pointing out moreover the character of much of the reading matter current, especially among our young people. In addition to the books so justly criticised by him, there is another class which deserves an equal amount of reprobation that finds its way into many houses where its character is not suspected. We refer to that class which, under the guise of conveying instruction in an entertaining way, blends with the information given, false and demoralizing views of life and of men. The knowledge thus imparted cannot redeem these books from utter condemnation, when the fact is remembered that those portions of the works in question which are supposed to give them their peculiar value are rarely by any chance perused, the reader almost invariably skipping them when, as is always the case, they interrupt the thread of the narrative which forms the most attractive feature. These books, whose name is Legion, are as harmful in their effects upon mind and body as are those which Prof. Anderson so properly criticises, and they should share in the sentence of banishment from home, school and other libraries for which he pleads.

Dr. G. F. Witter furnishes an article in continuation of his subject of last year, upon

THE WATER SUPPLY OF WISCONSIN,

in which he calls attention to some dangerous defects of the present utter want of system for supplying a great primary need of

life, and pointing out the means by which even those not possessing any technical knowledge can examine the water used for household purposes, and determine with a good degree of accuracy upon its fitness for drinking. The remedies for existing evils are also shown. While Wisconsin is not yet in the condition of some of the older states, where the fouling of the soil and the consequent contamination of the water has been going on for generations, until at the present time it is almost impossible to find a well from which water fit to drink can be obtained, it is yet certain that the utmost care on the part of our citizens is even now needful. "Wells cannot be depended on for supplies of wholesome water unless they are carefully and thoroughly guarded from sources of surface and subsoil pollution. Some of the foulest of well waters are clear, sparkling and have no unpleasant taste or odor." *

Prof. T. W. Chittenden has made an extended investigation into the condition of the water in actual use in one of the smaller cities of this state, the results of which are set forth in a paper, entitled

AN INVESTIGATION OF THE DRINKING WATER OF A CITY,

in which also the methods of examination are detailed at some length, and the results clearly set forth. The connection between a bad water supply and the virulence of an epidemic is here shown, as it has been in numerous other instances of late years. Appended to this paper are tables modeled upon those published by the Massachusetts Board of Health, in which are given the results of analyses of various well and spring waters in actual use in the city in question, and showing in suggestive contrast the comparative purity at the present time of water drawn from several rivers of the state. On presenting this paper to the board, the writer remarked upon the difficulty of convincing the non-scientific portion of the community that any importance could attach to the many minute precautions deemed necessary by chemists and other scientists even in such an apparent trifle as drawing a sample of water for analysis. A probable consequence of the neglect of

* Report of Mass. State Board of Health for 1878.

these seemingly over refined and scrupulous measures is to be observed in the wide difference noted in the analysis of the waters of the Wisconsin river and those of some others. It is not probable that the water of the particular stream named is in reality so much purer than that of other rivers, the Fox, for example, as the figures given in the tables would indicate; in all likelihood, a large part of the difference would vanish had the sample of water for examination been taken from the latter stream by the analyst himself, with the employment of all the precautions used in the case of the former.

Prof. Chittenden contributes a second paper upon

SCHOOL BUILDINGS,

prepared at the request of the board, in which he has endeavored to show the most important features of a properly constructed school house. That there is urgent need of reform in the construction of our school buildings, is evident to every one who has given the subject any consideration, and it is believed this paper will repay careful perusal. We commend it especially to school officers. More than one-fifth of our entire population is in school, and these "second homes" which communities provide for their children, should be constructed with careful consideration of the physical as well as the mental needs of their inmates. Such has been the thought of the writer in the preparation of this article, and in contrast with the style of structure described in his paper, we quote the following from a letter recently received at the secretary's office:

"I have recently visited a couple of our village schools. What is called the intermediate is kept in an old house formerly used as a dwelling. Its dimensions are 22 feet 8 inches long, 17 feet 3 inches wide, and 7 feet 10 inches high. *The number of scholars in attendance on the average is forty.* The cubic space allotted to each is about seventy-six feet.* [The superficial area is rather less than ten square feet to each scholar.] The room is heated by a box stove; the scholars' and teacher's faces were flushed with a

* No school room ought to be constructed or permitted to be occupied which provides less than 300 cubic feet of space for each inmate, with efficient provision for an entire change of air at least three to five times per hour. The room above described should under no circumstances have been made to accommodate more than ten scholars.

purplish color, and I noticed that the respiration of the latter was about thirty-two per minute. [The normal rate is about eighteen.]

"The other school was in a better building, with a high ceiling; the ground surface was 28 by 25 feet, or seven hundred square feet. The number of pupils enrolled was one hundred. *They would just cover the floor if packed close!*"

We fear that an investigation of the school buildings throughout the state would discover some in which even close packing would not enable all their occupants to find room upon the floor; we have heard within the year of some schools which are so overcrowded as to forbid the attendance of the same scholars at the morning and afternoon sessions, a circumstance which may not, however, be an unmixed evil. One defect of our school accommodations to which Prof. Chittenden calls attention, is a disgrace to our civilization, and ought to be remedied, if no other means will avail, by stringent legislative enactment.

General J. Bintliff, as chairman of a special committee of the board on the

INSPECTION OF PUBLIC BUILDINGS,

has continued his labors in this department, and presents a report which shows the defective construction of some of our highest educational institutions. The subject is one worthy the especial attention of our authorities. In such institutions as those here reported upon, above all others, we should find the most efficient provision for perfect ventilation, and the most scrupulous attention to sanitary surroundings, not only because the physical welfare of their inmates require it, but also that these institutions may become educators in these prime essentials of healthful life. We submit the suggestion made a year ago, that if the plans of all public buildings, churches, halls and school houses were submitted to the supervision of some competent central authority, very much might be done to correct some of their most vital defects.

SPECIAL CORRESPONDENCE.

In the extracts from letters received at the secretary's office from various parts of the state, will be found a large amount of in-

teresting information furnished by careful observers. Many valuable suggestions are made to the board through the medium of these communications, and many gratifying assurances that not medical men alone, but a large number of our non-professional citizens appreciate the work of the board, and are in full sympathy with it.

CONCLUSION.

In conclusion, the board desires to express its thanks to all who have rendered assistance in the work of spreading a knowledge of sound sanitary principles among the people of this state, and its hope that sufficient means will be placed in its hands to enable it to give its reports, through which much must be done in the way of disseminating such knowledge, the widest possible circulation.

Very respectfully,

E. L. GRIFFIN,
JOHN FAVILL,
SOLON MARKS,
JAMES BINTLIFF,
J. T. REEVE,
H. P. STRONG,
G. F. WITTER,
State Board of Health.

THE METRIC SYSTEM.

This system of weights and measures has been adopted by most of the civilized nations in the world, and has been legalized by the congress of the United States.

It is already in exclusive use in some departments of the government service, and its universal adoption would be in the interest of economy, convenience and precision. It is a decimal system having but a single unit each for length, capacity and weight; the prefixes which indicate multiplication and division of these standards are the same in all, pointing out either increase or diminution by 10, 100, 1000, etc., thus rendering the system perfectly simple, and as easy of comprehension as is our present decimal system of coinage, and wholly avoiding the cumbrous and complicated tables of weight and measure at present in use.

We append a table giving its most important features, with the value of the standards in inches, quarts and grains; omitting those divisions and multiples which, like the mills and dimes in our decimal coinage, are not in common use.

The standard of LENGTH, upon which the whole system is founded, is

The METRE, which is equal to 39.37 inches.

The subdivisions of the metre which are most in use, are

The *Centimetre* ($\frac{1}{100}$ of a metre) = 0.3937 inch.

The *Millimetre* ($\frac{1}{1000}$ of a metre) = .03937 inch.

(For ordinary calculations, it will be thus seen that two and one-half centimetres, very nearly equal one inch.)

The multiple of the metre most generally employed is the *Kilometre* (1000 metres), which is equal to .62137 (about $\frac{5}{8}$) of a mile.

The standard of CAPACITY is

The LITRE, which is equal to 1.0567 quarts; its subdivisions and multiples are not very extensively used; they are the *decilitre* = $\frac{1}{10}$ litre, the *centilitre* = $\frac{1}{100}$ litre, and the *millilitre* = $\frac{1}{1000}$ litre.

The *Kilolitre* (1000 litres) is equal to 264.17 gallons, and is the multiple in most common use.

The standard of WEIGHT is

The GRAMME, which is equal to 15.432 grains Troy.

The subdivisions most employed are

The *Centigramme* ($\frac{1}{100}$ gramme), and the *Milligramme* ($\frac{1}{1000}$ gramme), and the multiple most employed is the *Kilogramme* (1000 grammes).

SECRETARY'S REPORT.

To the Board of Health and Vital Statistics of the State of Wisconsin:

GENTLEMEN: I have the honor to present the following third annual report of the secretary and executive officer of the State Board of Health of Wisconsin, it being for the year ending December 31, 1878.

The term of office of Dr. H. P. Strong having expired on the 31st of January, 1878, he was nominated by the governor for renewed membership in the board, and the nomination was confirmed by the senate. The list of members of the board therefore remains unchanged; it is as follows:

J. T. Reeve, M. D., of Appleton,	term expires Jan. 31, 1879.
Gen. Jas. Bintliff, of Darlington,	term expires Jan. 31, 1880.
Solon Marks, M. D., of Milwaukee,	term expires Jan. 31, 1881.
John Favill, M. D., of Madison,	term expires Jan. 31, 1882.
E. L. Griffin, M. D., of Fond du Lac,	term expires Jan. 31, 1883.
G. F. Witter, M. D., of Grand Rapids,	term expires Jan. 31, 1884.
H. P. Strong, M. D., of Beloit,	term expires Jan. 31, 1885.

During the year the board has held regular or special meetings as follows:

At Madison, Jan. 23, 24, 25.
At Fond du Lac, June 24.
At Watertown, July 17, 18, 19.
At Hubbleton, Aug. 28, 29.
At Madison, Aug. 29, 30, 31.
At Milwaukee, Dec. 17, 18, 19.

At a meeting held at Madison in January, the annual election of a presiding officer took place under the rules adopted at the organization of the board. Dr. E. L. Griffin was unanimously re-elected as president for the ensuing year.

The following committees were appointed:

On Finance, Drs. Favill, Marks and Witter.

On Legislation, Gen. Bintliff and Drs. Strong and Witter.

On Printing, Drs. Reeve, Favill and Griffin.

The following subjects were assigned as special fields of investigation and report to the different members of the board under the rules:

The preventable causes of typhoid fever, to Dr. Marks.

The water supply of the state in its relations to the public health, to Dr. Witter.

Homes for the people, to Gen. J. Bintliff.

General hygienic knowledge, a necessity for the people, to Dr. H. P. Strong.

Diphtheria as dependent on local filth causes, to Dr. E. L. Griffin.

An investigation into the extent to which hygienic study is pursued in our public schools, with suggestions thereon, to Dr. J. T. Reeve.*

The following subjects, while not specially assigned to any member, were recommended as worthy of special study:

1. Some of the more obvious causes of infant mortality, and how to avoid them.

2. The habits of the people as affecting their lives and health.

It was also

Resolved, That a committee of three be appointed to visit the public institutions and buildings of the state, to report upon the sanitary condition of the same, and to suggest such changes as may be deemed necessary to promote their healthfulness.

Gen. Bintliff and Drs. Marks and Reeve were appointed as such committee by the president, and power was given to the chairman

* At a subsequent meeting of the board, Dr. Reeve was requested to prepare a paper on "Land drainage, and the influence of obstructions to water courses upon the public health." In consequence of this request, he was relieved from the performance of the special duty previously assigned to him.

of the committee to associate with those gentlemen such other members of the board as he might deem expedient.

The Committee on Legislation presented a report in which was embraced the draft of a bill intended to secure a more perfect system of registration of births, deaths and marriages in the state. The proposed bill embodied such changes as in the opinion of the board were calculated to secure greater efficiency in the collection of such returns, and all medical members of the legislature, together with such others as were known to be specially interested in the matter, were invited to meet with the board, to the end that the bill might be thoroughly reviewed.

After this conference the bill, as finally approved, was introduced into the legislature then in session, but failed to become a law, and the statutes for the registration of vital and mortuary statistics in Wisconsin therefore remain unchanged.

Although the number of births and deaths recorded has been greatly increased, there being respectively about 2.37 times as many births, and 4.50 times the number of deaths reported during the year 1877, as in the year 1876, it is yet very evident that these returns are still so imperfectly made that no value can attach to them as bases of comparison for sanitary purposes.

No comparison of the returns of the above years with those of 1878 can yet be made, but it is known that in some localities, at least, the increase of returns in the last mentioned year over the two previous ones has been very great.

The reports of the secretary of state for the years 1876 and 1877 show the gratifying fact, that whereas in the former there were thirty-six counties in Wisconsin from which no returns whatever of births were made, and no less than forty which made no reports of deaths occurring within their limits, every county in the state, with three exceptions only,* made some report, more or less complete, of both, in the latter year. There has been but little increase in the number of marriages reported, the returns of which are evidently far more nearly correct.

* Pepin Co. makes no report whatever of births or deaths. Barron Co. reports two births and no deaths, and Douglas Co. reports no birth and only one death.

The whole subject of registration of vital statistics is confessedly one of remarkable difficulty in its practical management. While every community "is bound by the mere principles of self-interest and economy to establish such a system of registration of all vital statistics of any importance as shall enable it to know its own life history, and the influences that are moulding it for better or worse," * it is nevertheless true, that no state in the Union has as yet succeeded in collecting these statistics in such a manner as to cause the results to be regarded as even very nearly correct, though in some cases so near an approach to correctness has been attained as to render their statistics of great value. We are as yet very far from paying to this matter the serious attention which its importance demands; the Board of Health of the District of Columbia remarks that "European nations are so careful in this regard that they kept a record of their citizens even when they are absent from their homes, and request the vital statisticians of all foreign countries to certify to the death of any of their citizens occurring abroad." It also says, and we heartly indorse the wish: "We hope to see the day when this department shall be established, not only in every state, but in every city and district of the nation."

In the state of Wisconsin, with its sparsely settled districts, its varied nationalities, and the intense pursuit of the immediately practical, common to all new countries, the work of gathering these statistics with any approach to accuracy, is inevitably a labor which can only be performed with a large expenditure of time, patience and money. The legislation which this board sought to secure, last winter, contemplated the enforcement throughout the state of the only rule that has yet been found competent to secure correct returns in municipalities, i. e., the requirement of permits for the burial of the dead. It was believed by our legislators that such a requirement would entail hardship upon the inhabitants of sparsely settled districts, and that compliance with the law would often, ignorantly if not willfully, be evaded; hence the defeat of the bill of which mention has been made.

This being a matter the prudent and careful management of

† Prof Davies, Rept. for 1877.

which is of the highest importance, especially in the event that it should appear wise to urge the making of any radical changes in the present law, the board has not thought it well to seek further legislation upon it this winter. It appears indeed probable that the present national congress will be asked to co-operate with states in securing quinquennial collections of statistics throughout the Union, and the result of this request may have an important bearing upon the question. This board therefore simply holds the matter in abeyance, trusting that in the future there may come such a modification of public and legislative sentiment as will make it easy not only to secure any needed changes in the law, but will favor the scrupulous collection of statistics, the value of which to states and communities is becoming more and more apparent. In the mean time, the board, while using all consistent effort to secure compliance with the present law, has found in other branches of sanitary work ample employment for its time.

A somewhat striking illustration of the value of such statistics has been presented during the past year, in which it became the duty of the board, in the course of a sanitary investigation, to compare a district under investigation in which an undue amount of sickness and of mortality was alleged to have arisen from local causes, with other and neighboring districts, in which case the entire absence of all mortuary records rendered it impossible to make such comparisons with any degree of accuracy. Such returns, carefully collected and recorded, extending over a series of years, would here have been of the greatest service in enabling the board to reach a correct conclusion.

But though, as has been said, no value can attach to the collection of vital statistics hitherto made, as bases of comparison for sanitary purposes, they nevertheless possess all the legal value they ever had, and this value is increased *pari passu* with the increased number of the returns.

LOCAL BOARDS OF HEALTH.

The secretary is happy to report not only a large increase in the number of local boards which have complied with the law in reporting to this board, but also that many of the reports indicate that greater care has been taken in their preparation. There are still, however, many clerks who do not properly apprehend the fact that *the duly elected officers of a township form a board of health*, and that *the clerks of such townships are, ex officio, clerks of the boards of health*, and that a report from them is a duty required by law, which duty is wholly independent of any assistance they may receive from the boards of which they are members, or of the further question, whether such boards have ever assembled as boards of health or not.

For the better information of all concerned, we append the text of the statute by which it is made the duty of clerks and health officers to report annually to this board:

"The health physician and the clerk of the board of health, in every town, city and village, shall each, at least once a year, report to the State Board [of Health] their transactions, and such facts as shall be required, upon blanks and according to instructions furnished; and shall also make special reports whenever required. All officers of the state, the physicians of all mining, manufacturing and other companies or associations, all presidents, officers and agents of any company incorporated by or doing business under the laws of this state, shall, when requested, furnish, so far as practicable, the State Board [of Health] or its secretary any information required touching the public health; and every person refusing to comply with the provisions of this section shall forfeit ten dollars." (Rev. Stat., chap. 56, sec. 1410.)

The statute constituting town, city and other authorities local health boards will be found elsewhere in this report.

Quite a large number of these clerks have made the apologetic statement that such duty was wholly new to them, and that they were unable to obtain accurate statistics or to give anything like full answers, if indeed they could give any answers whatever, to

all the questions asked of them. These difficulties are fully appreciated by this board, but the clerks of local boards are again asked to remember that, for the present at least, this board is largely dependent upon them for much of the information that it needs, and that with a general knowledge of the facts required by this board in mind, it will surely be possible for them to give much information which is approximately if not absolutely correct, and from which conclusions of much value may be drawn. It has been gratifying to note the large number of voluntary communications that have been made to this office in connection with the formal reports, and it is hoped that all who have knowledge of any facts affecting the sanitary conditions of the community, will feel no hesitation in putting this board in possession of them; such information will always be welcomed by the board, either in connection with annual reports or at other times, while, if so desired, no publicity will be given to the name of the individual furnishing it.

Copies of the circulars sent to the clerks of local health boards throughout the state, and of the blank form upon which their annual report to this board should be made, are appended hereto.

OFFICE OF STATE BOARD OF HEALTH,

APPLETON, WIS., May, 1878.

To the Clerk of the Local Board of Health:

DEAR SIR: — Herewith I send you a blank on which to make your second annual report to this office.

Where no other local board of health has been organized, the statutes provide that the officers of every township, village or city, in this state, are a legally constituted health board, with clearly defined duties and powers.

Such boards have authority to appoint physicians as health officers; have the power to examine into all nuisances, sources of filth or causes of sickness, and to enter any building or premises for this purpose. They may make such rules and regulations concerning the same as they may judge necessary for the public health, which rules must be obeyed under heavy penalties. They have power to order removed or destroyed, at the expense of the owner or occupant of any premises, any nuisance, source of filth or cause of sickness that they may discover upon them, and, in the event of refusal or neglect to do so for twenty-four hours, may cause the same to be

done at the expense of said owner or occupant. They also have the power to isolate or remove to a separate house cases of any contagious disease which is dangerous to the public health.

In brief, these boards are the properly constituted health guardians of their respective communities, and as such are legally clothed wiith ample powers to enforce any needful regulations. With all such boards the State Board of Health desires to co-operate, and that such co operation may be intelligent and efficient, section 7, chapter 366 of the laws of 1876, provides "that it shall be the duty of the clerk of the local board of health in each township, city and village in the state, at least once a year, to report to the State Board of Health their proceedings and such other facts required, on blanks and in accordance with instructions received from the State Board of Health," and that special reports shall be made whenever required.

In accordance with these provisions of law, you will please fill the enclosed blank and return it to this office *as soon as possible.* As the making of such report is your duty under the law, whether your board has ever met in an official capacity or not, any expenses for postage, stationery, etc., are properly included in the ordinary expenses of your office.

With the blank sent to your predecessor for his first annual report, there was sent also a duplicate which he was requested to retain. If this was done, it will assist you in making this report. A duplicate of the blank for the second report is enclosed, on which you are requested to copy your report and file the same in your office for future reference.

It is not expected that you are in possession of such accurate knowledge respecting the prevalence of disease as will enable you to fill this blank with absolute correctness in all cases, but it is hoped that the experience of last year has given you some knowledge of what facts would be required, and that you are prepared to make this report with an approximation to such correctness. In the absence of positive knowledge, you will please bear in mind that your best estimates (stated as such) will form the most reliable information at present attainable by the board.

In the circular of last year, occasion was taken to urge upon each local board of health to appoint some physician as its health officer. This recommendation is repeated, and if your board has already a health physician, it is advised that you consult with that officer, particularly with reference to the questions concerning the character and prevalence of the diseases referred to.

You will please make such special reports to this office as will give to it early information of the outbreak or prevalence in your community of any contagious disease or diseases arising from causes which are believed to be preventable. Voluntary communications from the members of your board will always be welcomed.

A copy of the second annual report of this board will soon be

mailed to your address; please give it a permanent place in your office for the benefit of your successors.

By order of the Wisconsin State Board of Health,

J. T. REEVE, M. D.,
Secretary.

Annual Report of the Clerk of the Board of Health for the year ending May 31, 1878.

To the Secretary of the State Board of Health:

SIR: — The territory for which this report is made includes the corporate limits of the* ——— of ——— in the county of ———, containing about ——— acres of land. Its population numbers about ——— inhabitants, and is composed chiefly of † ———. Their principal occupation is ———.

About ——— of the land in this * ——— was originally covered with timber, chiefly ———. About ——— still remains covered with timber, and during the last year the timber has been removed from about ——— acres. There are now under cultivation about ——— acres. The nature of the soil is ———, and the crops chiefly raised are ———.

This *——— is ‡——— watered by the following streams and bodies of water, to wit: ———.

I estimate the number of acres of low or wet land from swamps, etc., to be now about ———. The proportion of this land which is capable of being efficiently drained is ———, and the number of acres of originally wet or low land that have been thoroughly drained during the last year is about ———.

The drinking water in this *——— is derived chiefly from ———, and the quality of the water is §———; the wells are of the average depth of ——— feet.

The proportion of dwellings having cellars which are either habitually damp or damp in wet weather is ———.

The average distance of privies from dwelling houses in this * ——— is ——— feet. The average distance of privies from the source of water supply is ——— feet; the least distance in any known case is ——— feet.

[Please give on a separate sheet, a full history of any cases where it is known or supposed that sickness has been caused by the contamination of the water supply through filtration into it of the contents of privies.]

The diseases which have been most prevalent in this *——— during the last year have been ———.

Upon the whole, the amount of sickness has been ¶——— than

* Insert township, village or city. † Give approximate proportion of nationalities represented. ‡ Insert poorly, well, abundantly, etc. § Hard or soft. ¶ Greater or less.

it has averaged for some years past in the proportion of ———, and the number of deaths has been ¶——— in the proportion of ———.

There have been in this *———, during the last year, to the best of my knowledge and belief:

——— cases of, and ——— deaths from *small-pox*, and there are now sick with this disease ——— cases.

——— cases of, and ——— deaths from *diphtheria*, and there are now sick with this disease ——— cases.

——— cases of, and ——— deaths from *scarlet fever*, and there are now sick with this disease ——— cases.

——— cases of, and ——— deaths from *typhoid fever*, and there are now sick with this disease ——— cases.

——— cases of, and ——— deaths from *measles*, and there are now sick with this disease ——— cases.

——— cases of, and ——— deaths from *whooping cough*, and there are now sick with this disease ——— cases.

[Please give in detail, on a separate sheet, the history of any special epidemics and the origin, where known, of any of these diseases; also the means which have been adopted to prevent their spread, with results.]

The diseases prevailing at the date of this report, other than those above enumerated, are ———.

The board of health of this *——— has appointed ——— as its health physician. His P. O. address is ———.

During the past year it has held ——— regular or special meetings, and its most important acts have been ———.

Dated, ———.

Signature, ——— ———,

Clerk of the Board of Health for the *——— *of* ———, *State of Wisconsin.*

Any additional information, written on a separate sheet, will be thankfully received — especially on the following points:

Reports of any cases of disease clearly traceable to local causes: such as impurity of drinking water from decomposing animal or vegetable matter, unhealthy food, stagnant water, etc.

Reports of any extraordinary amount of sickness or of unusual fatality in special localities. Instances of spread of contagious diseases in any unusual manner, etc.

Report of cases of sickness or of death, the origin of which is clearly traceable to the occupation of the individuals.

Report of unusual sickness or fatality among animals.

Instances of injury to life or property from kerosene oil or other explosive burning fluids.

Your opinion as to the principal sources of danger to the health of the citizens in your locality, and suggestions whereby local causes of disease may be removed, etc.

*Insert township, village or city. †Give approximate proportion of nationalities represented. ‡Insert poorly, well, abundantly, etc. §Hard or soft. ¶Greater or less.

Secretary's Report.

Reports have been received in reply to the above circular, and upon the blanks furnished, from 687 towns, cities or villages, the number being greatly increased in comparison with the preceding year, as will be seen by the following

STATEMENT,

In which will be found the names of all cities, townships and villages, from which annual reports have been received for the year ending May 31, 1878:

Adams Co. — Adams, Big Flats, Dell Prairie, Easton, Leola, Monroe, New Chester, New Haven, Preston, Quincy, Richfield, Rome, Strong's Prairie.

Ashland Co. — Ashland, La Pointe.

Barron Co. — Barron, Cedar Lake, Clinton, Dallas, Prairie Farm, Rice Lake, Shetek, Stanford, Sumner.

Bayfield Co. —Bayfield.

Brown Co. —Allouez, Bellevue, Depere, Eaton, Green Bay (town of), Holland (east), Humboldt, New Denmark, Pittsfield, Preble, Rockland, Scott, Suamico, East Wrightstown.

Buffalo Co. — Alma, Belvidere, Buffalo, Canton, Cross, Dover, Gilmanton, Glencoe, Lincoln, Maxville, Milton, Modena, Naples, Nelson, Waumandee.

Burnett Co. — Grantsburg, Marshland, Trade Lake, Wood Lake.

Calumet Co. — Brillion, Charlestown, Harrison, New Holstein, Stockbridge, Woodville.

Chippewa Co. — Anson, Auburn, Bloomer, Chippewa Falls, Eagle Point, Edson, Flambeau, La Fayette, Sigel, Wheaton.

Clark Co. — Beaver, Colby, Eaton, Fremont, Hixon, Levis, Lynn, Mayville, Pine Valley, Sherman, Sherwood Forest, Thorp, Washburn, Warner, York.

Columbia Co. — Arlington, Caledonia, Columbus Town, Columbus City, Courtland, Dekorra, Ft. Winnebago, Leeds, Lewiston, Lodi, Lowville, Marcellon, Otsego, Pacific, Portage City, Randolph, Scott, Springvale, West Point, Wyocena.

Crawford Co. — Clayton, Eastman, Prairie du Chien.

Dane Co. — Albion, Berry, Black Earth, Blooming Grove, Blue Mounds, Christiana, Cottage Grove, Cross Plains, Dane, Deerfield, Dunkirk, Fitchburg, Madison (town of), Montrose, Oregon, Primrose, Pleasant Springs, Roxbury, Springfield, Sun Prairie, Vermont, Vienna.

Dodge Co. — Beaver Dam, Burnett, Clyman, Elba, Emmet, Fox Lake, Herman, Hustisford, Lebanon, Leroy, Lomira, Oak Grove, Portland, Rubicon. Randolph, Shields, Theresa, Trenton, Waupun, Williamstown.

Door Co. — Brussels, Clay Banks, [illegible] Gibraltar, Jack-

sonport, Liberty Grove, Sevastopol, Sturgeon Bay, Union, Washington.

Douglas Co. — Superior.

Dunn Co. — Colfax, Dunn, Eau Galle, Elk Mound, Grant, Lucas, Menominee, New Haven, Peru, Red Cedar, Rock Creek, Sand Creek, Sheridan, Sherman, Spring Brook, Stanton, Taintor, Weston.

Eau Claire Co. — Augusta, Brunswick, Drammen, Fairchild, Lincoln, Ludington, Otter Creek, Pleasant Valley, Union.

Fond du Lac Co. — Alto, Auburn, Calumet, Eden, Empire, Fond du Lac City, Friendship, Ripon City, Rosendale, Taycheedah.

Grant Co. — Beetown, Boscobel, Cassville, Castle Rock, Clifton, Ellenboro, Fennimore, Harrison, Hickory Grove, Jamestown, Lancaster, Liberty, Lima, Little Grant, Marion, Millville, Mount Ida, Paris, Patch Grove, Platteville, Smelzer, Waterloo, Woodman.

Green Co. — Adams, Albany, Brooklyn, Cadiz, Clarno, Decatur, Exeter, Monroe, Mt. Pleasant, New Glarus, Spring Grove, Sylvester, Washington, York.

Green Lake Co. — Berlin City, Brooklyn, Green Lake, Kingston, Mackford, Manchester, St. Marie, Seneca.

Iowa Co. — Clyde, Dodgeville, Eden, Franklin, Highland, Mifflin, Mineral Point (town), Pulaski, Ridgway, Waldwick, Wyoming.

Jackson Co. — Alma, Hixton, Manchester, Millston, Northfield, Springfield, Black River Falls.

Jefferson Co. — Cold Spring, Concord, Farmington, Hebron, Ixonia, Koshkonong, Lake Mills, Milford, Oakland, Palmyra, Sullivan, Sumner, Waterloo, Watertown (town of), Watertown City.

Juneau Co. — Armenia, Clearfield, Fountain, Germantown, Kildare, Kingston, Lemonweir, Lindina, Lisbon, Lyndon, New Lisbon, Plymouth, Seven Mile Creek, Summit.

Kenosha Co. — Brighton, Randall, Salem, Somers, Wheatland.

Kewaunee Co. — Ahnapee, Casco, Kewaunee, Kewaunee Village, Lincoln.

La Crosse Co. — Bangor, Barre, Burns, Campbell, Farmington, Greenfield, Hamilton, Holland, La Crosse, Onalaska, Shelby, Washington.

La Fayette Co. — Belmont, Benton, Elk Grove, New Diggings, Seymour, Shullsburg, Wayne, White Oak Springs, Willow Springs.

Lincoln Co. — Jenny, Pine River.

Manitowoc Co. — Centreville, Cooperstown, Eaton, Gibson, Kossuth, Liberty, Maple Grove, Manitowoc City, Mishicott, Newton, Rockland, Schleswig, Two Creeks, Two Rivers.

Marathon Co. — Berlin, Hamburg, Holden, Hull, Knowlton, Maine, Mosinee, Rib Falls, Spencer, Stettin, Texas, Wausau (town), Wein, Weston.

Marquette Co. — Buffalo, Crystal Lake, Douglas, Harris, Moundville, Neshkoro, Newton, Oxford, Packwaukee.

Milwaukee Co. — Franklin, Granville, Greenfield, Lake, Milwaukee (town), Milwaukee City, Oak Creek.

Monroe Co. — Adrian, Angelo, Byron, Glendale, Greenfield, Jefferson, La Fayette, La Grange, Leon, Lincoln, Little Falls, New Lyme, Oakdale, Portland, Ridgeville, Sheldon, Tomah, Wellington, Wilton.

Oconto Co. — Gillet, Langdale, Little Suamico, Oconto City, Pensaukee, Peshtigo, Stiles.

Outagamie Co. — Appleton, Black Creek, Buchanan, Centre, Cicero, Dale, Deer Creek, Ellington, Freedom, Grand Chute, Greenville, Kaukauna, Liberty, Maine, Maple Creek, Osborn, Seymour.

Ozaukee Co. — Belgium, Cedarburg, Fredonia, Grafton, Port Washington, Saukville.

Pepin Co. — Albany, Durand, Frankfort, Lima, Waterville, Waubeck.

Pierce Co. — Clifton, Diamond Bluff, El Paso, Gilman, Hartland, Isabelle, Martell, Oak Grove, Prescott, River Falls, Rock Elm, Salem, Spring Lake, Trenton, Trimbelle, Union.

Polk Co. — Alden, Apple River, Balsam Lake, Clam Falls, Farmington, Laketown, Lincoln, Loraine, Luck, Milltown, Osceola, St. Croix Falls, Sterling, West Sweden.

Portage Co. — Almond, Amherst, Belmont, Eau Pleine, Grant, Hull, New Hope, Pine Grove, Plover, Sharon, Stevens Point, Stockton.

Racine Co. — Burlington, Caledonia, Mt. Pleasant, Norway, Racine, Raymond, Waterford, Yorkville.

Richland Co. —Akan, Bloom, Dayton, Forest, Henrietta, Ithaca, Marshall, Orion, Richland, Richwood, Rockbridge, Sylvan, Westford, Willow.

Rock Co. — Avon, Beloit (town of), Bradford, Centre, Clinton, Fulton, Harmony, Janesville (town of), Johnstown, La Prairie, Lima, Magnolia, Milton, Newark, Plymouth, Porter, Rock, Spring Valley, Turtle.

St. Croix Co. — Baldwin, Cady, Cylon, Eau Galla, Emerald, Erin Prairie, Hammond, Hudson (town), Hudson City, Kinnickinnick, Pleasant Valley, Star Prairie, Somerset, Springfield, Stanton, St. Joseph, Troy.

Sauk Co. — Delton, Excelsior, Franklin, Freedom, Greenfield, Honey Creek, Lavalle, Merrimack, Prairie du Sac, Reedsburg, Sauk City, Spring Green (town), Spring Green (village), Sumpter, Troy, Washington, Westfield, Winfield.

Shawano Co. — Almon, Angelica, Belle Plaine, Green Valley, Grant, Hartland, Herrman, Hutchinson, Fairbanks, Howe, Lesser, Maple Grove, Navarino, Pella, Richmond, Seneca, Waukechon.

Sheboygan Co. — Greenbush, Herman, Lima, Mitchell, Mosel, Russell, Sheboygan (town), Sheboygan City, Sheboygan Falls, Sheboygan Village, Sherman.

Taylor Co.— Little Black, Medford, Westboro.

Trempealeau Co.— Albion, Arcadia, Burnside, Caledonia, Dodge, Hale, Lincoln, Pigeon, Sumner, Trempealeau, Unity.

Vernon Co.— Bergen, Clinton, Coon, Forest, Genoa, Greenwood, Hamburg, Harmony, Jefferson, Kickapoo, Liberty, Stark, Sterling, Webster, Wheatland, Whitestown.

Walworth Co.— Bloomfield, East Troy, Elkhorn, Geneva, La Fayette, La Grange, Linn, Lyons, Richmond, Spring Prairie, Sugar Creek, Walworth, Whitewater.

Washington Co.— Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Richfield, Schleisingerville, Trenton, Wayne, West Bend (village).

Waukesha Co.— Brookfield, Lisbon, Mukwonago, Muskego, New Berlin, Ottawa, Oconomowoc (town), Vernon, Waukesha.

Waupaca Co.— Caledonia, Dayton, Dupont, Farmington, Fremont, Helvetia, Larrabee, Lind, Little Wolf, Matteson, Mukwa, Royalton, St. Lawrence, Union, Weyauwega.

Waushara Co.— Aurora, Coloma, Dakota, Deerfield, Hancock, Leon, Marion, Mt. Morris, Oasis, Plainfield, Poysippi, Richford, Rose, Saxville, Springwater, Warren.

Winnebago Co.— Black Wolf, Clayton, Menasha City, Neenah (town), Nekimi, Nepeuskun, Oshkosh City, Poygan, Rushford, Utica, Vinland, Winchester, Winneconne, Wolf River.

Wood Co.— Auburndale, Centralia, Grand Rapids (town), Lincoln, Marshfield, Rock, Wood.

These reports, which are all properly recorded for permanent preservation and reference, form a kind of panoramic representation of the sanitary condition of the state from year to year, from which many facts of interest and importance to the health and lives of our citizens may be gathered, the character and course of an epidemic noted, together with any local conditions which may either tend to the aggravation of such an epidemic or to the deterioration of the public health in general. Many of them have been accompanied by letters, which have added to the information contained in the formal reports facts, of interest and value.

The clerks of local boards have formed a convenient and appropriate medium through which have been distributed a large number of the circulars printed by this board on the prevention and restriction of contagious diseases and the treatment of the apparently drowned. These circulars have been frequently called for, and the secretary has taken great pleasure in their distribution in all appropriate cases, believing, with a correspondent from Benton, that

"they are a good means of popular sanitary education," being "read and appreciated by the people."

The number of local boards of health that have appointed health officers is much greater than at the date of the last report of the secretary, though as the appointment of such officers is a matter wholly optional with the local boards, the number is yet very much smaller than it should be.

From many quarters word comes to us that "our country is so exceptionally healthy that the appointment of a health officer seems entirely unnecessary." Yet we venture to say, that in every one of these localities a competent sanitary inspector would find causes of disease and ill-health lurking concealed in many an unsuspected corner, the removal of which would amply repay its cost in the higher standard of health that would surely follow. We feel it, therefore, our duty again to urge the subject upon their attention; many a community has been ravaged by diphtheria, typhoid or scarlet fever, and the like, which would have remained unscathed, or, at worst, would have escaped with but a light visitation, had proper authority been used to clear out all foul cellars, disinfect cesspools and privies, and put the community generally in a state of defense against these universally dreaded foes.

The whole number of health officers appointed by the local boards, of which this office has any knowledge, is one hundred and thirty. To many appointees the position is a wholly new one, and it may seem to them, and to the boards appointing them, that there are no special duties in connection with the office for them to perform. Yet a careful inspection of towns, even among those regarded as exceptionally healthy, would, in many cases, reveal the fact that the healthfulness is due to other causes than the intelligent pains and care taken to secure it. That abundant occupation exists for such an official in every town in the state we have heretofore tried to show, and we repeat here, from a former report, some brief suggestions concerning the character and duties of these important officials:

"The power to appoint physicians as health officers is given to local boards of health, and in all cases where it is practicable a physician should be selected, because, as a class, physicians can best

appreciate all those influences which are sources of danger to the public health.

"It is impossible to point out in detail the various duties which devolve upon health officers generally. To them and to the boards they represent is committed the guardianship of the health and lives of their fellow citizens. Those who are thus honored and confided in, should therefore seek by special study to prepare themselves for this responsibility. They should be students of sanitary science — men of skilled judgment — who are capable of leading both the boards they represent and the people in sanitary knowledge, and of giving to them such practical hygienic instruction as will tend to avert disease, or restrict it to its smallest possible limits.

"As worthy the most careful observation and study of such officers, we recommend such topics as the foods and clothing, the habits and occupation of the people, the construction and ventilation and drainage of their habitations, and of their public buildings and school houses, the location of their wells, or other water supply, with reference to cesspools, privy-vaults, barn-yards, or other sources of soil contamination from filth, the drainage of swamps and low lands, etc.; in short, of everything which can unhealthfully affect the character of air, of water, or of soil, to the purity of which every man has an inherent right.

"Of necessity, the various unsanitary influences affecting particular localities can be known fully, only to those favorably situated for studying those influences. The health officer of every local board of health should therefore seek to inform himself concerning his special locality, and particularly to understand the unsanitary conditions which favor the presence of that large class of diseases which are known to be preventable. Such knowledge will enable him promptly to advise with reference to the probable approach of such diseases, and of the local causes contributing thereto, to the end that such sanitary rules may be promulgated and enforced as will avert the threatened calamity, or, if this be impossible, to check and stay the progress of disease. In many cases of contagious disease, this may be accomplished by the thorough isolation of the first persons sick, and thus destructive epidemics may be averted. In all such cases the local board, under the direction of the health officer, should act with the utmost promptness."

The secretary acknowledges the receipt of many valuable communications from officers of this class, some of which may be found among the communications of special correspondents.

Before dismissing this subject, it may be well to give the following summary of the powers and duties of local boards of health, prepared by the attorney general of the state from the new revised statutes:

Secretary's Report.

1. TOWN BOARDS, VILLAGE BOARDS, AND THE COMMON COUNCILS OF EVERY TOWN, VILLAGE AND CITY, SHALL BE BOARDS OF HEALTH, unless otherwise provided in city or village charter.

2. Every such board of health may take such measures and make such rules and regulations as they may deem most effectual for the preservation of the public health.

3. May examine into *all nuisances*, *sources of filth*, and *causes of sickness*, and may make such rules and regulations respecting the same as they may judge necessary for the public health and the safety of the inhabitants.

4. Whenever any nuisance, source of filth, or cause of sickness shall be found on private property, the board of health *shall* order the owner or occupant thereof to remove the same at his own expense *within twenty-four hours*, and if he shall neglect or refuse to comply, he shall forfeit not less than five nor more than fifty dollars, and said board may cause the same to be removed and may recover all expenses incurred therefor, from the said owner or occupant, or from such other person as shall have caused or permitted the same.

Whenever the board of health shall think it necessary for the preservation of the health of the inhabitants, to enter any building or vessel in their city, village or town, for the purpose of examining into and destroying, removing or preventing any nuisance, any member of the board may make complaint, under oath, to a justice of the peace of his county, whether such justice be a member of such board or not, stating the facts in the case, so far as he has knowledge thereof. Such justice shall thereupon issue a warrant directed to the sheriff or any constable of the county, commanding him to take sufficient aid, and, being accompanied by two or more of the [members of the] board of health, between the hours of sunrise and sunset, to repair to the place where such nuisance, source of filth or cause of sickness complained of may be, and the same destroy, remove or prevent, under the direction of the members of such board of health.

Signed, ALEX. WILSON,
Attorney General.

About one-third of all the townships reporting to this office make no report of the diseases concerning which special inquiry was made, to-wit: small-pox, diphtheria, scarlet fever, typhoid fever, measles and whooping cough, and it is inferred — in many instances, indeed, it is expressly stated — that no case of any one of the above named diseases had occurred during the year for which the reports were made. Forty-five towns report the occurrence of small-pox to a greater or less extent, one or two having suffered quite severely; two hundred and twenty-six report that diphtheria has prevailed, in some quite extensively; scarlet fever has appeared in one hundred and ninety-two localities, typhoid fever in one hundred and seventy, and measles in one hundred and twenty-four. Whooping cough has been prevalent in one hundred and ninety-five communities.

Of the above-named diseases, three towns only report themselves as having been visited by all, during the year. Sixteen places report the presence of five out of six of the unwelcome guests, forty-seven have seen four of them, and seventy-five have given unwilling entertainment to three. Two have obtained a lodgment in one hundred and fifty-one localities, and a single one has had a footing in one hundred and forty-eight.

Every one of these diseases is classed by our best writers among preventable diseases. Small-pox might be absolutely "stamped out of existence" in a comparatively short time, by a system of compulsory vaccination rigorously enforced, while the means of preventing scarlatina and diphtheria are treated of at length in this and in former reports of this board, as well as by means of circulars upon the subjects, which, as has already been said, have been freely sent wherever and whenever they have been called for. It is hardly too much to say that *at least nine-tenths of all the cases of the six diseases named above, occurring throughout the state during the past year, could, in their origin, have been traced to some wholly avoidable cause.* Had the systems of isolation recommended, not only by this board, but by all the most reliable writers upon contagious and infectious disorders, been put into operation and rigidly enforced, in every instance in which small-

pox, diphtheria, scarlet fever, measles, or whooping cough appeared in any community, it is safe to say that a second case could hardly have occurred; while with regard to diphtheria and typhoid fever, scarcely anything seems better established than the fact that they are, in a large majority of cases, in their origin at least, filth diseases, and may be avoided by proper attention to perfect cleanliness in all respects, especially by scrupulous and fastidious attention to the character of the water supply. One correspondent, who writes that the circulars of the board were freely distributed and did much service in his neighborhood, adds (and others have written to the same effect) that "people would visit the sick, and would not be restrained from holding and attending public funeral services in case of death," which public services were without doubt the efficient means of scattering disease and suffering and death broadcast through many a community.

Public sentiment in this state will not tolerate the adoption of regulations already enforced in some older communities, both in Europe and America, which allow only the officials of the local health boards to come into contact with the body of one dead from any contagious or infectious disorder; forbid all funeral ceremonies at the time of burial, and in some cases hurry the corpse away for interment within a very few hours after death, nor is such stringency needful, perhaps, in our comparatively thinly settled communities; yet there is abundant evidence contained in the correspondence received at this office, that great need for caution exists, and that ignorance of the dangers arising from the needless exposure of the body at funeral services, has already caused the sacrifice of many valuable lives.

But there is yet another aspect in which the returns of death and disease are to be considered; another point of view from which they must be seen before their full significance can be apprehended; that from which the individual is regarded only as a member of the body politic; one in whom the state has a valuable pecuniary interest, which is lessened by sickness and infirmity, and entirely lost in case of death or total disability.

"In this view man may be regarded as a productive machine,

which creates property or sustenance for itself and the commonwealth. The state has an interest in the health and strength and effective power of each of its members, and it has a claim upon all to develop themselves bodily and mentally to the greatest extent, and thus to add each one to the aggregate power and wealth of the whole."*

Hence the sum total expended by individual families upon sickness and death, becomes a very important factor in the estimation of the political economist, in whose character we now propose to examine the reports already considered from other standpoints.

It will be remembered that these reports are for the year ending May 31, 1878, and hence are not an index of the amount of disease now prevailing. Small-pox, for example, which, as has already been stated, was reported as having occurred in forty-five different localities, does not now exist, and for several months, so far as is known, has not existed anywhere within the limits of the state. This circumstance, however, is of no importance as regards our present purpose, which is to draw certain economic conclusions from the figures to be presented.

The following tabular view gives the actual number of cases of each of the diseases named as they have been officially reported by the clerks of the local health boards. The aggregate number of localities from which reports have been received in which information is given as to the presence or absence of one or more of these disorders during the past year, is five hundred and fifty-three. The returns from the city of Milwaukee have been purposely omitted from this table, in order to give greater prominence to the prevalence of these diseases in the less densely populated portions of the state: †

* Dr. E. Jarvis, in Mass. Rept. of 1874.

† The official reports of the city of Milwaukee gives the *number of deaths* in that city from the six diseases under consideration, and for the same year, at 331. For the year preceding, to wit, for the year ending May 31, 1877, during the prevalence of a special epidemic, the deaths from the same disease were 688. For the calendar year 1876, the deaths numbered 451. Since Milwaukee has a population less than one-tenth as great as that represented in the tables, it will be seen that the estimates made are not greater than we would be warranted in anticipating.

Secretary's Report.

	Small Pox.	Diphtheria.	Scarlet Fever.	Typhoid Fever.	Measles.	Whooping Cough.
Number of localities where disease has appeared	45	226	192	170	124	195
Total number of cases reported	421	3,324	3,098	1,016	5,963	4,862
Total number of deaths reported	70	618	872	159	55	57

Giving in all a total number of cases reported..... 18,684
And total number of deaths reported... 1,331

This table, it must be understood, is constructed upon the basis afforded by the numbers given in the reports forwarded to this office, and by no means represents the total amount of sickness from the six diseases referred to, even in the districts which have reported. For, while all localities are included from which any numerical statements whatever have been received concerning the maladies in question, no account could be taken of many places from which indefinite returns were made, such as "few," "some," "several," "many" and the like.

With this explanation it will, we think, be entirely fair to assume that the districts which have not reported at all upon these diseases, have suffered from them at least in proportions similar to the regions from which reports have been sent. Upon this supposition, we shall have the following as the probable numbers of cases and deaths from the six disorders under discussion, occurring through the whole state, Milwaukee excepted, during the year for which the reports were made:

Total number of cases of sickness..... 30,813
Total number of deaths resulting..... 2,346

Now upon a very moderate estimate, taking into account the known character of all these maladies, each one of these cases of sickness has caused an expenditure of fifteen dollars, in addition to which, each case that has terminated fatally has rendered needful a further expenditure, amounting to at least fifty dollars. Hence we have the following figures to represent the cash outlay caused

by the sickness resulting from the six diseases named, a very large proportion of which might certainly have been prevented by proper hygienic means:

Cost of sickness	$462,195
Cost of death	117,300
Total	$579,495

More than a half million of dollars!

But these figures do not by any means represent the total cost to the community of the above amount of sickness. Supposing that only one-fifth of all who have been ill have been producers, that the average term of illness has been but ten days, and that the value produced in each case was one dollar per diem only, we shall then have a further sum of $61,630 as the loss sustained by reason of temporary disability; and if we allow, as is entirely fair, a moderate sum as a charge for the care of the sick, estimating the value of this service in each case at $2.50, or on an average rate of twenty-five cents per diem, and setting the duration of each case at ten days as above, we have the sum of $77,032.50 to represent the cost of this item, thus making the grand total $718,157.50,* or nearly three-quarters of a million of dollars as the cost to the people of the state, outside of the city of Milwaukee, of an amount of sickness almost wholly preventable, and this too, be it remembered, during a year when, notwithstanding the fact that certain disorders have been to a greater or less extent epidemic, the large majority of officials who make any report upon the subject at all, declare that the amount of sickness has been less than, or not more than equal to the average of former years.†

*The force of these figures may be better appreciated, perhaps, when we state that they exceed the total combined annual cost of the salaries of all state officers, of the legislature, of the supreme and circuit courts of the state, of the State Historical Society, of the State's Prison, of both of the Hospitals for the Insane, of the Institutes for the Deaf and Dumb, and for the Blind, of the Industrial School for Boys, of the Soldiers' Orphans' Home, and of the State Library.

†Out of a total number of 466 town clerks and health officers who have reported concerning the *amount* of sickness during the year ending May 31, 1878, as compared with the preceding years, 328 report less sickness than common, 34 report about the usual amount, and 104 affirm that their districts have suffered more from sickness than in former years.

This is doubtless true of the state at large and of sickness in general, the reports concerning other diseases from numerous correspondents, being to the effect that their attacks have been exceptionally light. Nor is the amount of sickness and mortality from the diseases under consideration to be esteemed as something very exceptional, since the number of deaths from them, as reported in the vital statistics accompanying the United States census of 1870, is given at 2,133 for the whole state, the total number of deaths from all causes being given by the same authority at 9,960.

Viewing the matter in this light, we believe that we have stated the cost to the people of the above mentioned preventable diseases at a much lower sum than the truth would warrant us in doing. We see, then, that even as a matter of dollars and cents alone, if no higher considerations were involved, the state can well afford — that indeed it is the bounden duty of the state — to extend to its citizens every aid for the prevention of disease, or for its restriction within the smallest possible limits.

It is not claimed that the figures given above are absolutely correct; it will, however, be borne in mind that they are based upon the best and official estimates of the men who, in each community, are in the best possible position for forming accurate opinions upon the subject. As a matter of fact, it appears very certain that in many instances the estimates of the number of cases is very much too low,* inasmuch as from many localities the *number of deaths only* is reported. It is highly improbable that in any single town any one of these diseases terminated fatally in all instances; on the contrary, it would seem almost certain that for each death there were additional cases of sickness which ended in recovery. No liberty, however, has been taken with these figures on this account, and they are given in the above statement precisely as they were received at this office.

* That the truth of this assumption may be the more apparent, we note here that in the reports of the city of Milwaukee for the year 1877, the ratio of mortality of the three most fatal of these diseases (no statistics of the others being given), is officially stated at almost exactly twenty-five per cent, while we have assumed it at but little over fifteen per cent.

ANNUAL REPORTS.

The importance of printing a greatly increased number of copies of the annual report of the board has been very apparent, the number allowed to the board for distribution being wholly insufficient even to supply a copy to each of the local boards of health, who by law are required to report to the State Board annually, while the main object of publishing these reports is at once defeated, if there be not a supply sufficient to insure their liberal distribution among the people, for whose especial benefit the instructive articles upon the prevention of disease have been prepared. Recognizing this fact, the last legislature passed a special act, authorizing the publication of 6,000 copies of the second report, in addition to those printed under ordinary usages, thus making the number 8,000 copies in all, and enabling the secretary to give them a wide circulation throughout the state. It is much to be regretted that this act was not permanent in its operation, but, through the ambiguity of its language, applied only to a single year. As the reports have hitherto increased each year in value and interest, it is hoped that this defect may be remedied at the coming session of the legislature.

Very gratifying testimony to the interest in sanitary matters is given by the fact that these reports have been largely called for by our citizens. To this result the press throughout the state has greatly contributed, by its frequent commendatory notices of the work of the board, which fact has been recognized by the board in the adoption of the following preamble and resolutions:

WHEREAS, The press of the state, with very few exceptions, by its frequent friendly utterances in regard to sanitary science, and its cordial sympathy with the State Board of Health, has evinced its interest in and willingness to promote the cause of preventive medicine; therefore

Resolved, That the State Board of Health gratefully recognizes this friendly attitude, and fully appreciates this support.

Resolved, That it shall be the policy of the board to more fully avail itself of this channel through which to reach the people of the state with such facts, hints or suggestions as relate especially to the removal of sources of danger to public health and the promotion of personal hygiene.

SPECIAL CORRESPONDENTS.

The number of these has been increased, during the past year, only to a limited extent. The board earnestly desires to secure, in every important locality in the state, one or more correspondents among "men who are in full sympathy with the objects for which this board is laboring," but there are yet many districts in the state in which the board has no regular or efficient assistance of this kind. It is hoped that such a body of intelligent and interested auxilliaries can be organized, and that the board may be enabled confidently to look to them for the purpose of securing information, trustworthy in character, concerning any epidemic or other "diseases that may at any time prevail in the state, and the causes thereof, together with any facts of interest concerning the sanitary condition of the district in which the observer may live." The results of this effort have thus far been very encouraging, and the board looks with great confidence for the co-operation of a corps of workers thus obtained and organized, in gathering knowledge and in extending its work among the people.

The board has no desire or intention to limit the work of special correspondents to members of the medical profession. If hitherto its appeals have been chiefly addressed to them, it has been for the reasons that through the media of state and county medical associations they were more readily accessible, and because by training and general habits, it was supposed that they possessed peculiar qualifications for the work. But teachers, clergymen, architects, and men and women in many other walks of life, ought to be as much interested as any in the diffusion of sanitary knowledge, and the board desires to repeat and emphasize the wish expressed at its organization, that all citizens of the state shall cordially co-operate with them in their efforts to cultivate a field which still lies fallow to so great an extent.

"Communications upon local or general causes of disease, studies or statistics of the topography, geology or water supply of the state in their relations to disease, or upon any other branch of the general subject, are invited from all who are interested in sanitary

science." The Massachusetts Board of Health and the Agricultural and Horticultural societies of our own and other states have received valuable communications from women; certainly there are some subjects, especially those relating to home hygiene, conditions of living, and similar topics, which no one can treat so well or from so thoroughly practical a standpoint as she who presides over the household, and upon whom so much responsibility rests both in sickness and in health.

A copy of the following circular was sent to all regular correspondents of the board, in September last, and extracts from the correspondence thus developed are herewith presented. We invite especial attention to these extracts, as exhibiting a marked increase in the interest shown in sanitary studies during the past year. The fact that such interest is exhibited, is among the most gratifying evidences that the work of the board is exerting a beneficial influence upon the people of the state.

OFFICE OF STATE BOARD OF HEALTH,
APPLETON, *September* ——, 1878.

DEAR SIR: This board desires again to obtain from its special correspondents, such definite information as they may be able to give of the diseases which have been prevalent in the state during the past year, and of the causes contributing thereto. Will you therefore have the kindness to reply to the following questions:

1. Within your observation, what has been the amount and type of the sickness in your locality, for the year ending September 1, 1878, as compared with previous years? Give the causes of any variation as far as you are able to do so.

2. Please give a brief statement of the diseases which have been most prevalent in your locality during this time.

3. In your judgment, have any of these diseases been to any extent preventable, and if yes, will you favor us with your views as to their causes, and of the best methods for their prevention?

4. Please report at length any special cases of disease clearly traceable to local unsanitary conditions of any kind.

5. Please give your opinion as to the principal sources of danger to the health of the citizens of your locality.

6. State any facts known to you whereby the healthfulness of your locality has been affected, whether favorably or unfavorably, by changes therein by the drainage of wet lands, by the removal of forest trees, by the building of dams, canals or other public works.

In indicating to you in this manner some of the points on which information is desired, the board wishes it to be understood that any information bearing on the work before it, will be acceptable. The board is anxious that you should make accurate and careful observation as to any and all *local causes* of the diseases which you observe and treat, and that you incorporate the result of such observations in your reports to it. It is the hope of the board to secure a corps of correspondents who will each be so fully in sympathy with its work that they will, as they have opportunity, make independent investigations and studies as to the causes and prevention of disease, and communicate the results thereof to the board. To this end it solicits the utmost freedom of correspondence. If it be desired that any portion of your report be considered as confidential, in the sense that the the board will not be at liberty to make extracts from it for publication, if desired, please state that fact in your report.

Please reply by the 15th of October if possible, using the enclosed stamped envelope and leaving any excess of postage to be paid at this office.

By direction of the State Board of Health.

J. T. REEVE, M. D.,
Secretary.

PAPERS PRESENTED WITH THIS REPORT.

Inasmuch as the papers which have been approved for publication in the third annual report are specifically mentioned in the general report of the board, no further reference to them is deemed necessary in this place.

THE LIBRARY.

The library of the board has been increased during the past year by the receipt of the following volumes:

By Gift — Transactions of the Medical Association of the State of Maine from 1874 to 1878, inclusive, 5 vols., from C. O. Hunt, M. D., secretary; Transactions of Medical Association, State of New Hampshire, 1878, from G. P. Conn, M. D., secretary; Transactions of Medical Association, State of New York, from 1873 to 1878, inclusive, 5 vols., from the Society; Transactions of Medical Society, State of Michigan, 1878, from G. P. Ranney, M. D., secretary; Report of Board of Health and State Medical Society, Alabama, 1878, from T. A. Means, M. D., secretary; Transactions State Medical So-

ciety, Wisconsin, 1878, from the secretary; Transactions State Agricultural Society, Wisconsin, 1877–78, from G. E. Bryant, Esq., secretary; Report of Department of Agriculture, Illinois, vol. 14, 1876, from S. D. Fisher, Esq., secretary; Farm Drainage, circular 43, Department of Agriculture, Illinois, from S. D. Fisher, Esq., secretary; First Annual Report State Board of Health, Minnesota, from F. Staples, M. D.; Sixth Annual Report of same Board, from C. N. Hewitt, M. D., secretary; Report of State Board of Health, Massachusetts, 1878, from C. F. Folsom, M. D., secretary; Report of State Board of Health, Michigan, 1877, from H. B. Baker, M. D., secretary; Second Biennial Report of State Board of Health, Maryland, from C. W. Chancellor, M. D., secretary; Report of Board of Health, District of Columbia, 1877, from the Board; Report of Board of Health, city of Mobile, 1876, from J. S. Searle, M. D., health officer; Report of Board of Health, city of Brooklyn, 1875–76, from H. A. La Fetra, secretary; Report of Board of Health, city of Dayton, Ohio, 1878, from T. L. Neal, M. D., health officer; Report of Board of Health, Reading, Penn., 1878, from the Board; Report of Board of Health, city of New York, year ending May 1, 1875, from the Board; Report on Public Hygiene and State Medicine, from F. W. Hatch, M. D., Sacramento, California; Address on Hygiene and Preventive Medicine, by H. I. Bowditch, M. D., from Col. F. H. Putney; Smithsonian Reports, 1873–74, from the secretary; Registration Statistics, Michigan, 1872, from H. B. Baker, M. D., superintendent; Report of Board of Health, city of Milwaukee, 1877, from I. H. Stearns, M. D., health officer; Report of Board of Health, city of New Haven, 1877, from C. A. Lindsay, M. D., health officer; Report of Board of Health, Hudson county, New Jersey, from the Board; Report of Board of Health, city of Richmond, Va., 1876, from C. S. Brittan, M. D.; Report of Board of Health, city of Richmond, Va., 1877, from J. L. Caball, M. D.; First Annual Report Board of Health, State of New Jersey, from E. M. Hunt, M. D., secretary; First Annual Report Board of Health, State of Mississippi, from W. Johnson, M. D., secretary; Eighth Annual Report of Vital Statistics, city of Albany, N. Y.; Wisconsin Historical Collections, 1873–76, one vol., from the Society; Reports on Barracks and Hos-

pitals, on Hygiene of the United States Army, with descriptions of Military Posts, on Transportation of Sick and Wounded by Pack Animals, and Approved Plans and Specifications for Post Hospitals, from the office of the Surgeon General, U. S. Army; Report of State Board of Charities and Reforms, Wisconsin, 1877, from the Board; Report of the Department of Public Works, city of Chicago, 1876–77, 1 vol., from E. B. Chesbrough, Esq., city engineer; Legislative Manual, State of Wisconsin, 1878; from Hon. H. B. Warner, Report of Secretary of State, 1878; Report of Department of Agriculture, 1872-3-5-6-7, from Hon W. G. LeDuc, Commissioner of Agriculture, Washington, D. C.; Report on Drainage and Sewerage of the city of Salem, Mass., from D. M. Balch, Esq.; Report of Asylum for Feeble Minded Children, Lincoln, Illinois, 1877, from C. T. Wilbur, M. D., superintendent; Compendium of Massachusetts Census, 1875, from Hon. C. D. Wright; Sixth Annual Report of Dairymen's Association, Wisconsin, 1878, from the Society; Vital Statistics of City of Wilmington, Del., 1877; Nomenclature of Disease, prepared for the use of Medical Officers, United States Marine Hospital Service, from J. H. Woodworth, M. D., Supervising Surgeon General; Report of Supervising Surgeon General United States Marine Hospital Service, 1876–77, from J. H. Woodworth, M. D.; Instructions for Registry and Returns of Marriages, Births and Deaths in the State of New Jersey, from E. M. Hunt, M. D.; Schools of Forestry and Industrial Schools in Europe, Economic Tree Planting, and Lessons from European Schools and the American Centennial, from B. G. Northrop, Esq., Secretary Board of Education, Connecticut; Report on Registration of Marriages, Births, Deaths and Divorces, State of Connecticut, made by the State Librarian to the General Assembly, 1876-77; Causation of Typhoid Fever (Fiske Prize Fund Essay), from Rhode Island Medical Society; Ames Eagle Odorless Excavating Apparatus; and Investment for the Insane, from A. Ames, M. D.; Annual Report of Hospital for the Insane, Maryland, 1877, from A. Ames, M. D.; Public Libraries in the United States of America, Parts 1 and 2, from Bureau of Education, Washington, D. C.; Dangerous Cosmetics, by M. Benjamin, from the author; Adulteration of

Milk, by H. A. Mott, Jr., Ph. D., from the author; New York Quarterly Cancer Journal, July, 1878, Explorations in Cell Pathology, and New York Medical Eclectic for July, 1878, from R. S. Newton, M. D.; Triumphs of Medicine, by J. R. Buchanan; Is Modern Education Affecting the Eyesight of Children? by A. W. Calhoun, M. D., from the author; Annual Report of Northern Hospipital for Insane, Oshkosh, Wis., 1878, from W. Kempster, M. D.; Transactions of Medical Society, State of Tennessee, 1878, from J. D. Plunket, M. D.; The Brighton Abattoir, Brighton, Mass.; Chicago Medical Journal and Examiner, August, 1878, from E. Wigglesworth, M. D.

This office is also receiving regularly the weekly and monthly reports of the boards of health of various cities throughout the United States, which it acknowledges by exchange. Thanks are due to many of the newspapers of the state, of which copies containing sanitary items of general interest have been sent to this office.

The following volumes have been purchased for the use of the board during the year:

Popular Science Monthly, 9 vols.; Waring's Draining for Profit and for Health; Bayle's House Drainage; Klippart's Land Drainage; Youth's Book of Health; How We Raised Our Baby; Historical Atlas of Wisconsin; Flint's Physiology; Dunglison's Medical Dictionary; Blandford's Insanity; Wiley's Hospital Construction; Mitchell on Nerves; Maudsley's Body and Mind; Chavasse's Management of Children; Verdi's Maternity; Hufeland's Art of Prolonging Life; Blacks' Ten Laws of Health; Williams on the Eye; Tuke's Insanity and its Prevention; Hodge on Feticide; Tredgold's Ventilation; Jacobi's Infant Diet; Maudsley's Responsibility in Mental Disease; Perkins' Best Reading: French's Farm Drainage; Beard's Hay Fever; Kingsley's Health and Education; Dobell's Coughs, Consumption and Diet; Marsh's Hand-Book of Rural Sanitary Science; Bigelow's Nature in Disease; Letheby on Foods; Fox on Ozone; Waring's Earth Closets; Dobell's Vestiges of Disease; Miller's Place and Power of Alcohol; Winslow on the Influence of Light; Marcet on Food; Fox's Sanitary Examination of Air, Water and

Food; Gorton's Principles of Mental Hygiene; Wilson on the Skin; Chavasse's Aphorisms; Holbrook's Hygiene of the Brain; Wood on Sunstroke; Getchell's Management of Infancy; Smith's Lectures on Nursing; Egleston's Villages and Village Life; Weale's Water Works; Huxley and Youman's Physiology; Smith's Foods; Smith's Health; Lewes' Physiology of Common Life; Bellow's How Not to be Sick; Butler's Ventilation of Buildings; Helmholtz's Scientific Lectures; Hinton's Physiology; Weale's Drainage of Towns and Buildings; Worcester's Dictionary; Princeton Review for May, 1878; Toronto Sanitary Journal, Vols. 1, 2 and 3; Ziemssen's Cyclopedia, 16 volumes; Goodholme's Cyclopedia, 1 volume; Holly's Modern Dwellings; Hammond's Diseases of the Nervous System; and subscriptions to Sanitarian; Plumber and Sanitary Engineer; and Popular Science Monthly.

EXPENSES.

The report for the year 1877 ended with expenditure shown by voucher No. 95. There should be added to the expenses shown in that report the sum of $84.15, being for official expenses of members incurred in the year 1877, but not audited at date of making that report, and for which vouchers numbered 96, 97, 98, 99 and 100 were subsequently approved.

The expenses for the present year are shown by vouchers numbered 101 to 178, inclusive, as follows:

Official expenses of members	$605 54
Postage and box rent	596 32
Paper, stationery, etc	90 33
Printing and binding	119 85
Books and instruments	509 61
Secretary	1,500 00
Office furniture	47 40
Chemicals for experiments	22 80
Analyses and special services	145 10
Miscellaneous, including freight, express, etc	74 96
	$3,711 91

Among the more expensive instruments and appliances found necessary for the work of the board, are a Microscope, an Electric Pen, a Casella's Anemometer, and sundry books of reference, the cost of which has helped to increase the expenses of the year, so that it was necessary to draw upon the savings of previous years; yet, from the economy which has heretofore been practiced, about $800, of such savings being still unexpended will revert to the state.

In the statement above given, there has not been included a special appropriation of $300, made by the legislature to aid in printing the reports of the year 1877, heretofore referred to.

Very respectfully,

J. T. REEVE, M. D.,
Secretary.

DIPHTHERIA.

ITS RELATION TO FILTH CAUSES.

BY E. L. GRIFFIN, M. D.,
Fond du Lac.

No disease classed as preventable more properly receives the thought and study of sanitarians, than does diphtheria at the present time. Its death-rate throughout the country is annually on the increase. Its frequent occurrence in many localities in the state; its frequent epidemic character; its great virulence and excessive mortality, should awaken earnest inquiry on the part of health boards with reference to its possible modes of origin, the removal of known causes, and the means best adapted to prevent its spread.

Diphtheria is ranked among the so-called zymotic or fermentative diseases; diseases which are supposed to have their origin in the implantation within the system from without, of some kind of leaven or ferment whose action produces the symptoms of the malady.

This leaven or ferment may find its favorable conditions in polluted water; structural defects of dwellings; a generally polluted atmosphere, or in the specifically polluted respired air of one who has already fallen a victim to the disease.

Diphtheria is justly ranked among the principal epidemic diseases of the country, and contributes very largely to the mortality list. Modern science and sanitary study place it prominently in the list of preventable diseases. Indeed, it may be regarded as one of the best types of preventable diseases.

Diphtheria.

In its origin and dissemination, it is intimately connected with "structural defects," while it is often spread through personal agencies.

It is preventable, like ague, by the removal of certain local causes.

"When diphtheria gets an introduction to a house, if the children are living under good sanitary conditions, it generally falls lightly; but if the reverse is the case, and especially if they happen to be drinking excrementally-contaminated water, in its occasionally appalling fatality, greater than that of any of our ordinary infectious diseases of the present day, the disease reminds us of those epidemics of the middle ages from which we are happily now free."

Its *cause* in many cases may elude our observation; nevertheless it is confidently believed to have always a specific cause, and that patient and persistent research, guided by intelligence, will, in a large majority of cases, discover that cause.

It has become an accepted truth that "the knowledge of a disease is half its cure," and when the medical profession and the common citizen shall come to intelligently recognize the conditions under which this malady reveals itself, and the manner in which it is disseminated, we believe it will be greatly limited in its prevalence, and that the mortality from this cause will be much lessened.

The very general belief that diphtheria is comparatively a new disease is hardly sustained on theoretical or on historical grounds. There can be no doubt but that the earliest constructed habitations of men presented a natural breeding-nest for this disease, and the oldest Greek and Roman writers on medicine make frequent reference to a disease, the symptoms and course of which bear a close resemblance to that which we call diphtheria.

The present name, *diphtheria*, meaning a prepared hide, from the tough membrane formed in the throat, was given to it by the French writer, Bretonneau, about the year 1820. The name, however, does not appear in the mortuary reports of Europe or of this country until about the year 1855 — and it was not generally incorporated into the nomenclature of diseases until a few years

later. In the year 1858–9, it took on an epidemic form of great severity and of wide diffusion both in this country and in Europe, with a fatality so great that the professional mind seemed very generally agreed that it was a new type of the disease.

The mortality from diphtheria is now very great. It ranks next to that of scarlet fever. The loss is largely among children of from two to fourteen years of age.

During the four years, from 1873 to 1876, inclusive, 6,877 persons died of diphtheria in New York city alone. In Massachusetts, it is second in fatality only to consumption, 5,027 having died in that state during the year 1877 from this cause.

This mortality, large as it may seem, does not exceed the proportional death rate from the disease in very many cities and towns in this state.

In the whole range of diseases peculiar to childhood and youth, there is scarcely one whose approach is more sudden, whose progress is more insidious and persistent, whose sequelæ are more deplorable, whose ravages are more extensive, and whose presence in the family excites a more profound apprehension.

It may be stated that great diversity of views prevail with regard to the nature of this disease. By some it is thought to be a constitutional disease with local manifestations. By others, it is believed to be a local disease with constitutional effects.

It is not thought advisable to bring into the discussion of this paper this question, or the one as to what constitutes the infectious element of diphtheria, and the several theories of its implantation, or in what way it may be connected with the low forms of vegetable growth observable upon the affected surface, but rather to confine ourselves to an examination of the question of its probable origin, the modes in which this infection is spread, and what would constitute prudent and rational means for its avoidance and arrest.

While diphtheria may not be as markedly infectious and contagious as scarlet fever, it is very generally conceded to have its origin and to be propagated in one of the three following methods:

1. *By inoculation.*
2. *By contagion.*

3. *By certain unsanitary agencies or conditions.*

1. *Inoculation.* That diphtheria is an inoculable disease is admitted by all careful observers. While this method of communication is the least frequent and the one seldom likely to obtain, yet the possibility that the disease can be so conveyed to an otherwise healthy subject, will suggest prudent measures by which such a calamity may be avoided. Recent experiments have shown not only that where there is an immediate contact between the product of diphtheritic inflammation and a softened mucous membrane or denuded skin, contagion will almost immediately take place, but that the disease is nearly if not quite as inoculable as small-pox or syphilis. Corroborative of these statements, are the grave facts that in several instances physicians, when operating upon a diphtheritic trachea, have been inoculated with the disease by some of the matter from the diseased trachea spattering upon their eyes or lips. The frequency with which diphtheria has been propagated by matter coming in contact with denuded skin or wounds, show how readily inoculable it is.

Great care should be taken to prevent any spread of the disease from *contact* with particles of false membranes, which have occasionally killed the physician even before the death of the patient.

2. *Contagion.* The contagious character of diphtheria is well established. Under certain circumstances not yet fully understood, this contagious factor becomes very virulent. It is a germ disease, so called, like small-pox or scarlet fever. It often seizes robust children, who, at the funeral of playmates, in school or in church, are exposed to its direct influence. The presence of one sick person in a home sometimes communicates the disease to the susceptible, however carefully kept apart. Hence the material of infection must be, to some extent, diffusible through the air.

Like scarlet fever and small-pox, the specific germ of diphtheria clings with great tenacity to particular houses and apartments. Convalescents from this disease retain the power of communicating it for an indefinite length of time. Dr. J. Lewis Smith reports well attested facts brought under his observation, which clearly show that the diphtheritic virus, like that of scarlet fever, may remain for

weeks and months in apartments, notwithstanding moderate disinfection and sanitary precaution.

The infecting element is probably given off principally from the throat, with the breath or with the expectoration. It is more than problematical that the disease is ever disseminated, as some suppose, through mysterious and unknown atmospheric agencies; yet, like other infectious diseases, it is subject to an increased tendency at one time more than another, owing, perhaps, in part to conditions connected with the individual, but confessedly to causes as yet not well understood.

Its radius of infection through the atmosphere seems more limited than that of small-pox or scarlet fever. The case reported by a recent English physician is in strong proof of this statement; where a large school of pauper children entirely escaped the disease, although it was markedly epidemic throughout the village, and many cases occurred in close proximity to the school.

The facility with which the disease can be carried from one place to another, is a matter which has been too generally overlooked, or not considered of sufficient importance to demand precautionary measures.

It is believed that water and milk, the latter especially, by reason of its readiness to absorb volatile organic matter, and the infecting material of certain diseases by mere exposure, may become impregnated by diphtheritic emanations to such a degree as to convey the disease to otherwise healthy persons.

This latter statement receives confirmation by the report of Dr. Nickerson, of Lowell, Massachusetts, where in a certain house a lad was very sick with diphtheria. The stench from this case was very strong and penetrated all apartments of the house. A young child living some distance from this case, in a healthy part of the town, was supplied with milk by this family. This milk was kept for several hours in an adjoining room before it was sent to the residence of the child. This child shortly sickened and died with diphtheria.

In an account of an outbreak of diphtheria in Fitchburg, Massachusetts,* there occurs this impressive history. A young man while

* See State Board of Health Report, 1876.

derangement of the water pipe, either above or below the surface, before they enter the sewer.

In the city of Chicago, during the same year, from August 1 to December 1, there were reported to the board of health 162 deaths from diphtheria, occurring in 122 houses. Each of these premises were carefully examined by a sanitary expert, and out of the whole number, only thirteen houses were found to be in good sanitary condition.

Says Dr. De Wolf: "Defective, broken or detached sewers, with basements saturated with filth; catch-basins full and offensive, houses filled with sewer gas; dark, damp and crowded houses, without ventilation; unsewered houses and neighborhoods, draining all slops into street gutters; filthy personal habits, which in some of the unsewered localities can only be characterized as beastly — all this tells the story of diphtheria in the city. Yet, in some instances, families suffer who are most carefully and scrupulously attentive to sanitary conditions. An odorless but poisonous gas may escape through some of the house traps, undetected; and again, evils which are developed and matured in dark and filthy places, "rest not in their cradles, but come forth, and often exert their most fatal effects in homes the most unlike those whose negligence had allowed them to grow and lurk."

Dr. E. M. Snow, of Providence, than whom there is in these matters no more competent observer in the country, says: "It is certain that diphtheria is a filth disease, and usually spreads from the influence or effects of foul air, arising from localized filth.

"With the assistance of a physician, and others, I have made considerable investigation of the causes of diphtheria during the past four months. I may say generally that in *every case except one*, we have found what we think to be sufficient cause of the disease. These causes are:

1. Foul air from privy vaults.
2. Foul air from sink-drains or cess-pools, generally through imperfect plumbing.
3. Impure water.

"The foul air is much worse when it exists in sleeping rooms.

We have one remarkable case where foul air was fully excluded, and impure water was the certain cause. I am satisfied that all the cases of diphtheria we have here are produced by one or more of these causes mentioned."

In further confirmation of the opinion that diphtheria is essentially a filth disease, and is generally associated with some organic impurity of air cr organic impurity of water, we quote from the expressed opinion of Dr. C. E. Billington, New York, who has made this disease a special study, as follows:

"I fully believe with you that the disease 'is generally introduced into a family through sources of pollution,' the number of cases so caused far exceeding those due to contagion or infection, though the disease is undoubtedly contagious.

"Even where successive cases occur in the same house or the same family, it is more often because all are exposed to the same noxious endemic influence than through communication from one to another, though the latter is not unfrequent, and should be sedulously guarded against. I believe this because I have so often seen successive cases rapidly developed in different families in the same building or neighborhood, where there had been no communication whatever between the families, and where an adequate cause was discovered in some sanitary defect. In other words, the diphtheria-producing virus is mainly bred in decomposing organic matters, and diffused by the emanations therefrom, though it is also reproduced in and disseminated from each case of the disease.

"These processes are greatly multiplied and intensified, as is well known, when to endemic filth causes is super-added that mysterious influence which we call an epidemic. In the years 1874–5, when diphtheria was very prevalent in my dispensary district, it became a matter of common remark to myself and associates, that in certain houses cases of the disease were especially numerous and severe. The sinks in these buildings having since been trapped, and escape pipes for sewer gas having been introduced, under the direction of the board of health, cases of diphtheria have ceased to occur in them, and their character for especial unwholesomeness has en-

tirely passed away. I think there can be no doubt that, could the benign influences of perfect drainage and ventilation, cleanliness and sunlight, be brought universally to bear upon human habitations, there would be no further practical occasion to study the therapeutics of diphtheria."

Dr. George Northrop, of Marquette, reports an outbreak of malignant diphtheria in that place, unmistakably traceable to polluted air, caused by the presence and decomposition of a dead cat in the cold air flue of the furnace. All the children of the family — three in number — were seized in quick succession, and all died, after a few days of sickness.

Two other children, members of a family occupying an adjoining house, and who were frequent visitors in the family afflicted, were also taken sick, and one died. Five adults contracted the disease, some quite severely, but all recovered. No other cases of diphtheria occurred in the place.

Two cases of *diphtheritic croup*, both of which proved fatal, occurred in the city of Fond du Lac, in the early summer of 1877, which were manifestly traceable to polluted air. The house in which the family resided stood adjoining and in close proximity to a meat market. To the rear end of this shop was attached a shanty shed, where the slaughtering of small animals was done, the blood being drained upon the ground, and allowed to soak away under the shed, and to some extent under the sleeping room of these children, which was adjoining and within a few feet of this slaughter pen. During the heat of early summer, the stench from this accumulated filth was unendurable, and compelled the closure of all doors and windows to maintain an existence. The suspension of this iniquitous practice, and the thorough removal of the accumulated filth, under the persuasion of legal measures, prevented any further trouble.

Dr. Henry P. Wenzel, of Theresa, Wis., reports the history of seventeen cases of diphtheria occurring in his practice, in which he carefully noted the sanitary surroundings of each case. Nearly all of these cases are traceable, unmistakably, to contagion through connection with other cases, or to marked filth conditions. He ar-

rived at the following conclusions, through careful observation of them:

1. Diphtheria may be generated by *filth, plus* a condition of the atmosphere at present unknown.

2. Diphtheria is infectious and contagious under certain conditions, and may be transferred through a limited period of time.

3. *Filth* increases the malignancy of diphtheria.

4. Isolation and cleanliness mitigate its virulence.

Dr. S. Marks, of Milwaukee, reports a case of malignant diphtheria in a young girl, which was followed by prolonged and distressing sequelæ, due to poison by sewer gas. This patient occupied a newly erected house, but an investigation revealed the fact that the wash-basin in the patient's sleeping room was connected with the common sewer without being trapped.

The village of New London, situated upon the Wolf river, has experienced an epidemic of diphtheria perhaps more extensive than any locality in the state from which we have had any report. It first broke out about the middle of April, making its appearance in some three or four families at about the same time, and in no instance could any of these cases be traced to contagion. It prevailed during the months of May, June and July, when there seemed to be a marked abatement of the disease until the middle of September, when it reappeared, more generally diffused, and with greater virulence. It seized upon both young and old alike. Having appeared in a family, it was a rare exception for any member of it to escape an attack.

Dr. J. R. Moore, a local physician, writes: "The disease has been confined almost entirely to the south side of the Wolf river. The north side is almost equally inhabited with the south. The soil here is very low and thoroughly water-soaked, a portion of the lots being much of the time under water. Drinking water is very poor, and it is usually considered unhealthy. The south side has an elevation of from 30 to 50 feet above the bed of the river. The soil is light and sandy; the water good, and here are located the best residences of the village.

"The question arises, why should the disease confine itself so en-

tirely to the south side of the river? My views are these: At the upper end of the village, is a hog-yard, the stench from which is sufficient to pollute the atmosphere of any town of twice the size of this. Nearly all the business of the town is done along the north bank of the river; and all the stores and shops are situated on the bank of the river. Many families live above stores, so that slops and excremental matter of all kinds are emptied into the river in high water and upon the bank in low water. This summer the water has been unusually low, and the result has been that from the hog-yard, the privies and slop holes along the river, there has been a polluted and poisonous condition of the atmosphere sufficient to produce any disease. This I believe to be the sole cause of the epidemic of diphtheria which is now afflicting this village."

2. *Structural Dampness of Habitation.*

While we may not be able to trace a very close connection between an outbreak of diphtheria and special geological formations, we can frequently observe a close relationship between certain conditions of sub-soil and situation of house and the disease. There is abundant evidence to sustain the view, that in its origin it is not unfrequently associated with structural dampness of habitation; conditions very often found within the state. Whatever promotes dampness of the dwelling, such as confined and stagnant water in the cellar, saturated or water-soaked soil beneath the house, allowing dampness from below, or porous material, such as poorly burned brick, wrought into the construction of the house, furnish conditions favorable to the origin of the disease.

Where dampness and *filth* co-exist in the soil, they furnish conditions most potent for its origin and propagation. It has been found to rage in some places with a virulence resembling the plagues of the last century, where the soil was shallow and the sub-soil impervious, conditions favoring well-pollution from surface drainage.

The favorite haunts of diphtheria have often been found to be low levels in the midst of unsanitary surroundings. A recent writer says: "I can point to isolated houses which have been attacked by diphtheria at intervals of years, where dampness has chiefly re-

sulted from the house being shut in and closely guarded by trees. I have been called upon on several occasions to investigate outbreaks of diphtheria on elevated and open localities, and have invariably found the same condition of dampness of habitation caused by faulty construction of the house, in localities where there was a stagnation of water, either from a flat table-land with an impervious sub-soil, or more frequently from the locality being a division of a water-shed, which is always a cause of stagnation of water."

Whatever conditions serve to favor fungoid growths, would serve to favor the incidence and persistence of the disease.

Dr. J. C. Hall, of Monroe, in this state, reports in regard to the outbreak of diphtheria in that town, that "The first case was that of a girl twelve years of age, who was one of four children occupying a tenement house which was in very bad condition. The house was old, the roof leaky, and the cellar half filled with water. As a consequence, the sills and other parts of the framework were mouldy and rotten. Dampness and decay pervaded the house.

"This case ran on rapidly to a fatal termination; no physician being called until the day before it died. The parents were advised to leave this house if they desired to save the rest of their children. They removed to the country in a few days, but the children were already poisoned and two more of them fell victims to the disease.

"Another significant circumstance is to be noticed. A little girl from the country was visiting at the house I have mentioned at the time the first case occurred. This visitor became ill at the same time, but was immediately taken to her home. This child died in a few days, and soon after the two other children of this family were seized, and both died. Now nothing seems clearer to me than that these six cases originated from the poisonous atmosphere pervading the house which I have mentioned, and that from this source, too, came the special malignancy that characterized these cases. I saw only the first case, but I am informed that all of them exhibited the same marked symptoms of blood-poison from the start.

"Did all the cases we had here, some twenty-five in all, come out of this same miserable house? It is possible, perhaps probable, for

some of the children of this house attended our public schools during the first few days of their sister's illness, the nature of the case not having been recognized."

3.—*Contaminated Water.*

Diphtheria is often found associated, both in its origin and severity, with impure water, conditions so frequently found in rural districts where well water it almost exclusively used.

"Of the sanitary defects which specially govern the *mortality*, the most potent is undoubtedly excrementally contaminated water." This has been found very often to be the cause where whole families have been suddenly carried off. The sudden influx of barnyard leachings or of house sewage, into the well, has brought sudden sickness and death into many homes. The following case will illustrate this point:

About the middle of July, 1878, a malignant form of diphtheria broke out in the family of Jacob Smith, in the town of Fond du Lac. Five children in this family died between the dates of July 19th and August 4th. Four of these cases took on the form of diphtheritic croup. The origin of this disease in this instance was undoubtedly *contaminated well water.*

The farm buildings stand upon a drift formation, with coarse gravelly sub-soil, through which water percolates as through a sieve. The barn is less than one hundred feet from the house. The well is nearly midway between the house and barn. By the side of the barn is a large heap of manure. Between this pile of filth and the well is a sag or basin, the central depression in which is just thirty-three feet from the well. The leaching from this filth is collected in the basin, and is gradually lost in the coarse sub-soil, furnishing an abundant supply of organic residuum for the well. A sample of this water, taken from the well at a later period in the season and subjected simply to Heisch's test, showed it to be very impure. During the heat of midsummer, the children who fell victims to this disease drank very freely of this water.

Repeated examinations of these premises failed to bring to light any other assignable cause of the sudden calamity which came upon

this family. Two other children belonging to another family living within thirty rods of this well, and drawing their supply of water from it, also sickened and died in the month of August, with diphtheria. From these cases, two other children in the neighborhood contracted the disease, but not in a fatal form. No other cases had existed in this vicinity at any time previous. It is quite likely that all of these children were in a condition of slow blood-poison; that the slow reception of minute doses of poison had so far worn away their power of resistance that when the explosion came in the case of the first child attacked, the disease found a ready soil in each of the other children, in which to kindle the same disease upon a very slight contagious influence.

Serious sanitary defects which are the immediate cause of disease, are often found to be present under the fair exterior of our best homes. These defects may escape the observation of the occupants, but should be recognized and pointed out by the intelligent and observing family physician. Cases which must be left unexplained at the time, *may*, if held under investigation, at a later period, develop facts which will dispel their mysterious nature.

The evidences in support of the frequent *filth origin* of diphtheria are so abundant, so well authenticated by observers whose testimony is entitled to the utmost credence, as to render it a matter both of prudence and of duty that every case of this disease should be carefully studied in all the possible modifying influences of its surroundings.

As further corroboration of the fact that contaminated well water may give rise to diphtheria, we quote the following report from Geo. W. Jenkins, M. D., Kilbourn City:

"A family of five children, father and mother, were all more or less sick with a fever, induced, as I fully believed, by drinking water which was very much contaminated by drainage from the barnyard.

"The well is situated between the house and barn, with a gentle slope towards the well. The yard was very foul from the accumulation of years, and the water in the well became impregnated with filth from this source, until it looked, tasted and smelt badly.

I ascertained from the family that when they moved upon the place the frost was in the ground, and the water, to all appearances, was good and pure. When the frost came out the water began to look, taste and smell badly. Of this water all the members of the family used until I was called to see the mother and daughter, who were suffering with a malignant form of diphtheria, attended with great depression of all the vital powers and bloody passages from the bowels. I explained to them the probable source and cause of their sickness and forbade the further use of this water. They soon began to improve and made a good recovery after using good water from another source. They continued to use this good water for a time, when they returned to the use of the water in the contaminated well. The mother very soon came down with exactly the same symptoms as before. The family soon left this farm, and a German, who owned it, having a family of eight children, moved upon it.

"He declared that the water was good and pure, and that the doctor did not know any thing about it. After using the water for a short time, one of the children came down with diphtheria, croupal form, and died in less than a week. After this, every member of the family was sick of the same disease, and five of them died in less than ten days from the date of the first attack. Is it reasonable to suppose that the cause of this sickness lay in any other direction than in this filthy well? I think not."

PREVENTIVE MEASURES.

1.—*Individual Sanitation.*

It has been suggested by Dr. E. M. Hunt, secretary of the State Board of Health of New Jersey, that when diphtheria appears in a family, or when it manifests itself in an epidemic form in any community, that we seek to establish, in the case of all unaffected children, by precautionary or prophylactic treatment, *vital resistance* to the onset of the disease, by introducing into the system agents of an antiseptic nature, and such as are known to be antagonistic to germ life. The suggestion is based upon the thought that there should be "opposing forces to disease, in its *inceptive* as

well as in its *declarative* stages," and that it may be possible "so to surcharge or pre-empt the individual as to nullify the toxic of the disease, or so dilute or suspend it as to make it harmless."

The suggestion is not without great significance, for the tendency of all study and investigation into the causes of zymotic diseases is towards the grand end — the discovery of an agent, as in the case of vaccinia, that shall render the animal economy an inapt soil for the implantation and growth of these diseases.

2.— *Outside Sanitation.*

Inasmuch as hygienic conditions exercise great influence over the type of diphtheria, it is hardly possible to give too much care concerning the unsanitary conditions that environ the home, or that may be found within it. Drain-pipes, catch-basins, sewers and privies, should be under constant watch-care. These latter deserve special mention. It is believed by the writer that the accumulation of human excreta in the common garden privy, so often neglected, and so repulsive to human sense and sight, is the very fountain and origin of many zymotic maladies. In ordinary porous soil, a common well will drain an area around it of one hundred feet radius. How many of the homes of the rich and the poor, all over the state, have the family privy within fearful proximity to the well, rendering it almost morally certain that the water which supplies the family for drinking and cooking purposes will at times be more or less contaminated with privy fluid.

After careful observation in country, in village, and in city, the conviction is reached, that there is no habit of civilized life touching good taste and common decency, so open to criticism and so reprehensible, as the almost universal neglect of the proper and timely removal of human excreta which are allowed to accumulate in near proximity to the dwelling for years and oftentimes for a whole generation of human life, sending forth sickening gases, polluting the air even beyond their recognition by human senses. They are wafted through the house by day on every breeze, and steal unnoticed into all the sleeping apartments by night. Who can deny but that these privy emanations, modified and intensified in their

poisonous character by the concurrent action of a certain degree of temperature and atmospheric humidity, do not, at times, become more virulent and produce an atmospheric medium fearfully inimical to child life. The ancient Hebrew was required by law to cover up with earth his excrement. Well would it be for all if this wise measure of sanitation could be re-enacted and re-enforced. Then would the abominations of open garden-privies, and the still worse disease-breeders, water-closets within the house, *close to sleeping rooms*, be done away with, and the death rate would everywhere be wonderfully diminished.

There is no good reason why diphtheria should not be dealt with as carefully as small-pox or any other contagious disease. It is relatively as fatal. It is as much under the control of preventive and sanitary measures as it is under the control of medicinal treatment.

"If all interested in this matter would, instead of regarding it as a visitation of God, set about inquiring into and removing the cause, much might and would thus speedily be done to stop the disease. For though God has established laws that control results, he has not directed nor ordained that nuisances and pollutions should be left where they will tend to produce disease."

Privy vaults should be kept at all times thoroughly disinfectad with dry earth, coal ashes or a strong solution of copperas — two pounds to a pailful of hot water. The contents of the vault should be removed from the premises, or buried at least one hundred feet from the well, twice every year, or often enough to prevent the air from being offensive.

House drains of all kinds should be so constructed and trapped as not to allow the escape of foul gases into the house. These require frequent examination to guard against obstruction and overflow.

The cellar should be kept well drained and dry, and should be as thoroughly and continuously ventilated as the season will admit. No animal or vegetable matter should be allowed to decompose in the cellar or around the building.

3.— *Ventilation.*

The greatest care should be exercised in every family where diphtheria has made its appearance, that the sick room and all the rooms of the house be kept thoroughly ventilated. Where the ventilation is imperfect, a single case of the disease will produce an infectious atmosphere, which, if connected with and favored by the condition of other members of the household, will develop new cases, and generally of a more malignant type. The peculiarly filthy emanations from a person sick with diphtheria, gives great force and value to this factor in preventive measures.

Cleanliness and purity in all things—in dwellings, in clothing, in person, in food and drink, and in the air we breathe, are the chief agencies upon which we must rely to keep diphtheria from effecting a lodgment and to prevent it from spreading among us. If these precautions are neglected, other measures will frequently prove unavailing.

It is of the utmost importance that the possible results of the first case of diphtheria in a family or in any given community, should be fully comprehended. The presence of such a foe to child-life in the family is an alarming fact. It is necessary that it should be met at once, and the process of reproduction stopped before it gets beyond control.

SPECIAL MANAGEMENT.

1. The origin in the body of every patient sick with diphtheria of the seeds by which the disease is spread, points to the necessity for *isolation* of each case at its very beginning. No measure is of so much value as this. It implies the exclusion of all excepting those who are absolutely necessary for the faithful nursing of the sick. An upper room is always to be preferred, provided it can be properly warmed, lighted and ventilated.

2. All needless articles, such as carpets, bureaus, pictures, books and whatever may gather and retain dust, or serve as hiding places for the poison, should be removed from the room before it is occupied by the sick person.

3. The common and expressive act of *kissing* the sick should not be indulged in by any member of the family.

4. Food taken into the sick room should not be partaken of by any one excepting the patient.

5. If the arrangements of the house will admit, each sick patient should occupy a separate room, through fear of aggravating the poison and intensifying the malignancy of the disease.

6. The vessels which receive the discharges from the bowels, the bladder and throat, should always contain some disinfecting fluid, and these vessels, when used, should at once be emptied. Bits of cloth should be used to wipe away the discharges from the nose and mouth, and these should be burned and not washed. Articles of clothing which cannot be cleansed by boiling or dry heat, should be burned.

7. Some strong disinfecting fluid, such as diluted bromo-chloralum, solution of chloride of lime or solution of copperas, should always be kept in the sick room to meet the various wants, for the cleansing of the utensils and the hands of the attendants.

8. After recovery, the patient should receive a general bath, with plenty of soap, be freshly clothed and be removed to another room.

9. Those who have the care of a patient sick with diphtheria should be scrupulously careful as to cleanliness of their own person and that of the patient.

10. All members of the family afflicted with diphtheria should be excluded from the public schools, and should avoid all intercourse with others so long as the disease may remain the family, or until, in the judgment of an intelligent physician, the danger of communicating the disease to others is past.

11. In case of death from diphtheria, the body should be wrapped in a clean sheet and placed in the coffin, as in the case of scarlet fever or small-pox, being well sprinkled with a strong carbolic solution, or solution of chloride of zinc, or well dusted over with chloride of lime, *and buried early. It should not be allowed to remain in the room occupied by the living.* The funeral should be conducted in a private manner, and always without exposure of the dead.

Diphtheria.

12. After the recovery or death of the patient from diphtheria, the room which has been occupied, with all its contents, should be thoroughly disinfected by fumigation with sulphur, or by chlorine gas. After being several hours exposed to one of these agents, it should be opened and well ventilated for several days before being re-occupied. Ordinary prudence would suggest repapering and a fresh coat of lime-wash.

Note. — To fumigate a room with sulphurous acid, close all the openings into the room, such as doors, windows, and chimney flues. Place upon the stove, hearth, or zinc base, a kettle containing a small quantity of ashes, upon which are placed some live coals. Upon these, put from two to three pounds of broken sulphur. This amount will be sufficient for an ordinary-sized room. The room should be kept closed six or eight hours.

To generate chlorine gas, the same preparation of the room should be made. Into an earthen vessel, containing four ounces of peroxide of manganese, pour about one pound of strong muriatic acid. Immediately leave the room, before the gas becomes diffused.

A convenient and efficient disinfectant for use in the sick room is bromo-chloralum, diluted with eight or ten parts of water.

To disinfect the vessels used in the sick room, and also privies which receive the dejecta of the sick, copperas may be used, in the proportion of one pound to two gallons of hot water.

THE PREVENTION OF

TYPHOID FEVER.

BY SOLON MARKS, M. D.,
Of Milwaukee.

That the yearly visitation of fevers, especially typhoid fever, causes the death of many of our citizens, besides rendering many others who are fortunate enough to survive an attack of this disease, entirely unfit for any kind of labor for weeks, months, and even years, is unquestionable.

If conceded, and I believe it is by all who have given the subject any thought, that human life has a distinctive money value, and that health is indispensable to prosperity, it is evident that not only individuals, but the state as a whole suffers great pecuniary loss from this disease. With these facts before us, it is natural to inquire, if this yearly contribution of human life and property is unavoidable, or with our present knowledge of the conditions which seem necessary for the production of the cause of this fever, whatever it may be, is it within the possibility of human effort to prevent the occurrence of such conditions, and thereby, in a great measure, stay the ravages of this terrible and destructive disease.

We are not prepared to say that a strict observance of well known sanitary laws would insure entire immunity from this disease; but as observation has proven that where this fever is found prevailing as an epidemic, such laws are generally entirely disregarded, we conclude that its prevalence is due, in a great measure to unsanitary conditions.

Typhoid Fever.

As might be expected, this fever is most likely to prevail where great numbers are congregated, as in prisons, military camps, and especially old hospitals, where every part of the structure is impregnated with emanations from diseased persons, and where, as is too often the case, the water-closets are badly constructed and provided with imperfect drains. In short, wherever decomposing human filth is allowed to accumulate, the conditions seem favorable to the spread of the disease.

One class of writers and observers is of the opinion, that the products of decomposing human excreta and animal and vegetable substances are, in themselves, sufficient to cause this fever, and claim to have abundant evidence to verify the correctness of their opinion. Others, however, claim that observation and carefully conducted experiments do not corroborate this view, and that the decomposition of the above named substances is not alone sufficient to produce typhoid fever; but that there is a specific typhoid poison which finds in them favorable ground for growth and multiplication.

In corroboration of these views, cities and villages are cited that are noted for imperfect drainage and accumulated filth, that have been exempt from this fever for years, after which, by the introduction of a single case, an epidemic of the disease has ensued.

It is claimed that the specific poison is produced by the decomposition of excrement from typhoid patients; that the excreta do not contain the poison when fresh, but that a few hours exposure to the atmosphere, with a temperature sufficiently high to favor decomposition, will develop a contagion of wonderful vitality, which under favorable circumstances is capable of retaining its infectious properties for a great length of time.

I quote from Ziemssen: "A villager, who had contracted typhoid fever at Ulm, returned to her native village, a place where typhoid fever had not existed for many years. The excreta of this person were thrown on the dunghill. Several weeks later, five persons were employed to remove the dunghill. Of these five, four were attacked with typhoid fever, and one with gastric symptoms and swelling of the spleen. The excreta of these five persons were

buried deep in the dunghill. Nine months later, two persons were employed in completely removing this dunghill. One of them was attacked with typhoid, and died of it."

Notwithstanding the different opinions entertained regarding the part played by animal and vegetable substances in the production of this fever, all agree in this, that they are important factors in the multiplication and spread of the poison, and that the importance of preventing their accumulation in and about human habitations, cannot be over-estimated.

It has been proven, beyond the possibility of a doubt, that not only the atmosphere, but water used for drinking and culinary purposes is often the medium through which the poison enters the system. The opinion, so generally entertained, that water passing a short distance through earth is deprived of all impurities, is erroneous.

Instances are numerous where water, impregnated with dejections from typhoid patients, has passed through hundreds of feet of earth without parting with its impurities.

It is related that in Switzerland, the dejections of typhoid cases were cast into a running brook irrigating a meadow, filtered through a mile of porous earth, and reappeared at a spring from which the people of a town drank. This acted as a source of the disease, and struck down more than seventeen per cent. of the inhabitants.

In view of these facts, it must be apparent to all who give the subject even a passing thought, that the greatest care should be exercised in locating wells a sufficient distance from privy vaults, cess-pools, drains, etc., to prevent the possibility of the water in them becoming impregnated with impurities from these sources.

As already stated, we believe that the prevalence and spread of this fever, both in city and country, is due in a great measure to decaying organic substances. In cities and large towns it requires the utmost watchfulness on the part of both citizens and authorities, especially if not provided with a proper system of sewers, to prevent their accumulating to such an extent as to endanger health.

Typhoid Fever.

Even in the country among farming communities, where it would seem that there should be no excuse for unsanitary conditions to exist, these substances are often allowed to accumulate year after year in and about dwellings, thus exposing the inmates to the deleterious influence of malaria rising therefrom, and, in many instances, houses are rendered still more unhealthy by imperfect drainage of cellars. These damp underground rooms being used for the storage of vegetables and other farm products, necessarily contain most of the time more or less organic matter in a state of decay. The gaseous products arising from such decay are sure to find their way into the usually poorly ventilated rooms above.

The well is generally located with a view to convenience, near the kitchen door, in close proximity to where the slops and other refuse is liable to be deposited. The privy is often not more than fifteen or twenty feet from the well, and in some instances even nearer than that, with a vault but a few feet deep, which is neither cemented or planked; in this condition, it is used by the family year after year without being cleansed, every shower filling it with water, liquefying its contents, and placing them in the most favorable state for percolating through the soil in every direction. The cattle barn and yards, horse-barn, pig-stys, hen-houses and other necessary out-buildings are within a few rods of the house, often nearly surrounding it.

It is true that we find farm houses where the internal arrangements and external surroundings are all that can be desired in a sanitary point of view, but any one who will take the trouble to observe the majority of these dwellings, as they exist over our state, will find very many in the unsanitary condition we have described, and it does not require argument to prove that they are not such conditions as tend to insure the highest degree of health; if they are not such as to cause typhoid fever themselves, they certainly tend to lower the vitality of those living in their midst, rendering them less capable of resisting the disease when brought in contact with it, than those who have not been exposed to like depressing influences.

In short, the conditions are such as to favor the development of

an almost unlimited amount of miasm, in case dejections from typhoid patients be deposited in the midst of these decomposing substances, which not only taints the air, but may be absorbed by water, milk and articles of food, endangering all who may chance to come within its influence.

From the fact that this disease is apt to attack great numbers when introduced into a community, many have been led to regard it as a purely contagious disease. Observation, however, has proven that it is not communicated directly from one person to another by contact, or through the breath and exhalations from the body.

"In the London fever hospitals, where 2,506 cases of typhoid fever were treated in 14½ years, there occurred during the whole time only eight cases which originated in the hospital."

It is well known that great numbers of typhoid patients are treated in the wards of our large hospitals, and it is seldom that physicians, nurses or patients contract the disease from being brought in contact with it.

It seems, therefore, from the above evidence, that this fever cannot be classed among contagious diseases.

If it be true, as already stated, that the poison is furnished from decomposing excrement of typhoid patients, and that it is capable of growth and multiplication if deposited in proper soil, we can readily see how, through the media of air, water and articles of food, this disease may spread not only from one member of a family to another, but from house to house, from village to village, and from city to city, without being purely contagious in itself.

It seems from the cases already cited, that there can be but little doubt regarding the vitality of typhoid poison, and of its ability to retain its infectious properties for weeks and months.

In further proof of this vitality, however, I quote from a very interesting essay on the causation of typhoid fever, prepared by George E. Waring, Jr., of Newport, R. I., and for which he was awarded the Fiske fund prize.

"Dr. J. M. Lazzell, in the Transactions of the Medical Society of West Virginia, for 1877, published a paper on the contagiousness

of typhoid fever, in which he describes an outbreak in the family of one Thomas, which in time produced such terror that no nurse or washer-woman could be induced to come to the house. The bed linen and clothing, soiled with typhoid dejections, were boxed up and carried away.

"Three months after the disease had disappeared from the country, and when the general health was good, a girl came from six miles distant to do the house work. Among other things she washed the boxed-up clothing. In ten or twelve days she was taken sick, and went home. Dr. Lazzell was called to her five days later, and recognized the same form of typhoid fever that had occurred in the Thomas family. Eleven members of her household were exposed, and eight of them took the disease. It did not attack a single person not so exposed."

From accumulated evidence, we conclude that when this fever is once introduced into a city, village or neighborhood, nothing but the most untiring vigilance on the part of those having charge of persons suffering from the disease, can prevent its rapid spread.

If possible, the patient should be placed in a well ventilated room in the second story, and disinfectants constantly kept in the apartment.

It is impossible to over-estimate the importance of the proper treatment of the dejections; they should be thoroughly disinfected the moment they are discharged from the bowels, and the utmost care taken to prevent the linen or bedding from being soiled with the excrement; but if this be impossible, it should be placed in some disinfectant fluid until it can be washed and boiled.

Throwing dejections from typhoid fever patients into water-closets, privy vaults or upon ground near dwellings, without their being first thoroughly disinfected, is criminal in the extreme. Depositing these dejections in water-closets in cities and large towns, where a great number of houses are connected with the same system of sewers, is especially dangerous, as through imperfect traps and defective pipes numerous families may be exposed to the poison though living at a great distance from each other.

Various disinfectants are recommended by different writers for

the purpose of disinfecting typhoid dejections, the majority of which will answer the purpose if thoroughly used.

I quote from Liebermeister: "As a rule, I have a porcelain bed-pan used, the bottom of which is strewed each time, before being used, with a layer of sulphate of iron; immediately after a passage, crude muriatic acid is poured over the fecal mass, as much as one-third or one-half the bulk of the latter being used for that purpose.

"Where it is practicable, the contents of the bed-pan should be emptied into trenches dug anew every couple of days and filled up when discarded, care being taken that they are not located anywhere in the vicinity of wells. Where nothing else can be done, the dejections will, of course, have to be emptied into the privy vaults, in which case they should be even more thoroughly covered with the crude acid. Any of the underclothing or bed clothing that is soiled during stool, should be immediately immersed in water or in a solution of chloride of zinc, and should be thoroughly boiled."

George E. Waring, Jr., recommends "that a chamber or bed-pan filled to the depth of an inch with dry earth or with sifted anthracite ashes, or with powdered charcoal, be used to receive the evacuations; that this be immediately covered with a further inch in depth of dry material, and that the whole be turned into a shallow hole in the ground and covered with earth not more than two inches deep, so that it may go through with its decomposition in the upper soil within easy reach of the oxidizing air. If to be removed quite away from the premises, the earth containing the dejections may be thrown into a barrel or box, each deposit being covered with fresh earth and carefully protected against rain."

A solution of permanganate of potassium (of the strength of one ounce to one gallon of water) is excellent for disinfecting soiled articles from the sick-room. Solutions of chloride of zinc and sulphate of zinc are also good. Chloride of lime is deservedly popular as a destroyer of putrid gases. Chlorine gas may be generated in a sick room by pouring strong vinegar or diluted sulphuric acid upon chloride of lime placed in proper vessels in the room. Sulphurous acid gas may be classed among the very best disinfectants for rooms that have been used by typhoid patients.

Typhoid Fever.

The following directions are given by Dr. Griffin:

"Place in an earthen vessel or iron kettle, containing a small quantity of ashes, a few live coals, upon which place from one to four pounds of sulphur in powder or fragments, according to the size of the room. A room containing 2,000 cubic feet of space would require about 4 pounds of sulphur or 1½ ounces to each 100 cubic feet of space.

CONCLUSIONS.

Notwithstanding the different theories which exist regarding the origin of typhoid fever, we believe the facts already gathered are sufficient to warrant the classification of this fever among the preventable diseases. If typhoid fever is capable of spontaneous origin in the midst of decomposing organic substances, as claimed by Murchison and others, it is certainly within the possibility of human effort to prevent the accumulation of these substances in and about our dwellings. On the other hand, if it be true, as claimed by Budd and those who believe with him, that this fever never originates *de novo*, but is caused by a specific poison which has its origin in decomposing dejections from typhoid patients, and that decaying organic substances simply furnish favorable soil in which the poison multiplies and spreads, the numerous disinfectants at our command enable us to prevent the decomposition of these dejections, thereby preventing the development of the poison.

Sporadic cases of typhoid fever may, and undoubtedly will occur from time to time, but if those having charge of such cases will conscientiously carry out well known preventive means, the disease will not extend, and epidemics of this fever will be unknown.

LAND DRAINAGE

AND

OBSTRUCTIONS TO WATER COURSES.

BY J. T. REEVE, M. D.,
Of Appleton.

Since the days when "Lot lifted up his eyes and beheld all the plain of Jordan, that it was well watered everywhere," and for that reason chose it for himself and for his flocks and herds, well watered lands have ever been highly esteemed and eagerly sought by the husbandman.

But if often happens that a large portion of the land which man attempts to cultivate is, in a certain sense, too well watered; that water is found upon it not only in the forms of living springs and running streams, but in the unwelcome shapes of stagnant pools, of swamps and marshes, or beneath its immediate surface in the less apparent condition which constitutes soil saturation. Indeed, it is only in exceptional cases that the natural contours of the surface and the conditions of soil and sub-soil are all that can be desired, or in which some means are not necessary to remedy this evil, and to determine whether the occupation of such land can be made either profitable or healthful.

How soon men began to learn that stagnant water might be removed by drainage, or to appreciate any of the benefits of this operation, we have no means of ascertaining. We may, however, imagine the time to have been nearly coincident with his first efforts to cultivate the soil, and we know certainly that drainage

for hygienic and sanitary purposes was scientifically conducted many centuries before the Christian era. Some of the works for these purposes were of immense extent and cost; one of the most eminent of sanitary engineers in modern times has said that "sanitary engineering has no nobler monuments than the aqueducts and cloacæ of ancient Rome," and their perfection and fitness for use after the lapse of twenty-five centuries, witness the truth of the assertion.

The traces of drainage for agricultural purposes, are of necessity much more indistinct, yet it is now nearly three hundred years since Oliver De Serres, a Frenchman, wrote a book in which he minutely describes its principles and practice, declaring that drains should be many and deep *without fear of excess on that score*, for "thereby not only are wet lands improved, but pools and swamps are converted into most exquisite plough-fields." * The whole essay, indeed, shows an appreciation of the benefits accruing from drainage which is hardly excelled at this present day; neither De Serres, however, nor Bligh, who wrote a half century later, appear to have had any practical knowledge of draining by means of tiles, although these are not of modern invention; for Klippart speaks of the discovery of well preserved specimens in the garden of a convent in France, which had "from immemorial time been renowned for its fertility, the beauty and earliness of its fruits and the friability of its soil." These tiles had been "made with masterly hands," and the existence of tombs over them which had not been disturbed for more than two and a half centuries, shows them to have antedated that period.

But the drainage of lands for agricultural purposes has attracted popular attention, and has been systematically conducted in this country only within a very few years. The United States have yet much to learn upon this subject from older countries. France, Belgium, Germany and England have all encouraged it by direct governmental aid, the latter country appropriating a fund equal to twenty million dollars "to be loaned to farmers to be expended in drainage," subject to repayment in small annual installments. The

* Vide Klippart's Princ. and Pract. of Land Drainage.

stimulus of substantial aid has likewise been extended to this practice in the dominion of Canada, where "certain main drains of great extent and capacity are opened by the government and paid for by general assessment, into which owners of real estate may empty the private drains constructed at their own expense." The legislatures of several states of our own Union have also passed drainage acts, by the aid of which large bodies of marsh lands have been reclaimed. From all of these experiments, as well as from those made by private individuals in numerous places, such results have been obtained as have abundantly established the fact that wherever the value of land is sufficient to warrant the expense of draining swampy or otherwise wet land, such operation becomes a source of very large pecuniary profit; nor does the experience differ in the case of land where there is a superabundance of moisture beneath the surface, even though the surface itself may be dry. There is much land where the surface ordinarily shows no really wet spots, but where a sub-soil exists, that is nearly or quite impervious.

The familiar illustration of a flower-pot with the bottom hole closed, aptly describes such land; the impervious strata below hinder the drainage of the soil, as does the closed bottom of the flower-pot hinder its drainage, until, for a variable height above these strata, the ground is so water-soaked and soggy as to be utterly unfit either for the maintenance of vegetable life or for the occupancy of human beings. Deep sub-soil drainage will usually accomplish for such lands what opening the hole in bottom of the flower-pot accomplishes for it, that is, it will render it light, warm, porous, fertile and healthy.

Such lands may occasionally exist where the surface is very uneven, perhaps even hilly, the water in such cases soaking through the surface soil until it reaches an impervious stratum along which it travels until forced to the surface, perhaps, as a spring on the hillside, or, failing sooner to reach the surface, it may spread over the low land at its foot, converting it into swamps or marshes. Of all such land, Mr. Waring says that "drainage is the key to all improvement."

Land Drainage.

The proportion of land to which this description applies, and which would be benefited by sub-soil drainage, is unquestionably very much greater than would be suspected by those who have not given special attention to the subject, or who have been accustomed to think of drainage only as chiefly applicable to land which is either actually swampy or obviously wet upon the surface.*

It may be interesting to note briefly the opinions of a few men who have closely investigated this subject of drainage. Mr. Johnson, a venerable Scotch farmer in Western New York, who was almost the pioneer of tile drainage in this country, and whose eminent success in this kind of work has caused him to be justly regarded as one of the best living authorities on the subject, says that he "never saw one hundred acres in any one farm but that a portion of it would pay for drainage." A committee appointed several years since by the State Agricultural Society of New York, to investigate the subject of drainage, after careful study, declared its belief that there was not, on the average, "one farm in seventy-five, in that whole state, but that needed drainage to bring it into high cultivation." And Mr. Cleveland, in a carefully prepared essay read before the Agricultural Society of the State of Illinois, says: "From data received from a great many sources, I feel no hesitation in declaring my belief that the crops of Illinois might be doubled by a judicious and thorough system of underdraining;" † while Gen. Viele says that drainage for agricultural purposes is the most remunerative of all labor.

* Judge French says: "An American traveling in England, in the growing season, will always be struck with the perfect *evenness* of the fields of grain upon the well drained soil. Journeying through a considerable portion of England and Wales with intelligent English farmers, we were struck with their nice perceptions on this point; the slightest variation in the color of the wheat in the same or different fields attracted their instant attention. 'That field is not well drained — the corn is too light colored.' 'There is cold water at the bottom there — the corn cannot grow;' were the constant criticisms as we passed across the country. Inequalities that in our more careless cultivation we should pass by without observation, were at once explained by reference to the condition of the land as to water."

† NOTE.— Since this paper was written, a circular issued by the Dept. of Agriculture, Ill., has been kindly sent to me by Mr. S. D. Fisher, Secretary, which shows that the subject of drainage is attracting great attention in that state. One evidence of this fact is that over fourteen million feet of drain-tile was manufactured in Illinois in the year 1877. The circular gives the experience and testimony of many Illinois farmers in favor of the practice of drainage as a source of profit.

Land Drainage.

Such testimony might be multiplied to indefinite extent — indeed, the opinion of all careful observers seems to be unanimous, that judicious drainage of the soil greatly increases the quantity and likewise improves the quality of the crops grown upon it. This fact, however, seems to be appreciated but to a very limited extent by the farmers of Wisconsin. It does not appear to have been the subject of discussion at any of the meetings of the State Agricultural Society, at least during the last ten years, and with the exception of a brief article from Mr. Stilson, in which he recognizes the fact that a large portion of the land of the state rests upon a close or clay sub-soil which requires draining to make its cultivation profitable, the subject has been only incidentally referred to.*

It appears to the writer to be eminently worthy the closer attention of land owners; many of the farmers of Wisconsin are cultivating a soil, the richness of which enables it in favorable seasons to yield fair and possibly abundant crops, but which has a sub-soil so retentive and impervious that this result depends wholly on the happening that the season may be neither too wet nor too dry. The yield of such land is always an uncertain one, and its owners may toil early and late and yet remain in poverty, not because they have not labored abundantly, but because they contend against the adverse forces of nature. Judicious drainage in all such cases would remove the chief element of uncertainty. Judge French says: "We hear no man say that he lacks skill to cultivate his crop; seldom does a man attribute his failure to the poverty of his soil; but, if we listen to the answers of farmers when asked as to the success or failure of their crops, we shall be surprised perhaps to observe how much of their want of success is attributed to *accidents*, and how uniformly these accidents result from causes that thorough drainage would remove. The wheat crop of one would have been abundant had it not been frozen out in the fall, while another has lost nearly the whole of his by a season too wet for his land. A farmer at the west has planted his corn early, and late rains have rotted the seed in the ground, while one at the east has been com-

* An interesting article on drainage, by Mr. Cook, may be found in the transactions of the Northern Wisconsin Agricultural and Mechanical Association for 1876-77.

pelled by rains to wait so long before planting that the season has been too short. Another has worked his clayey farm so wet (because he had not time for it to dry) that it could not be properly tilled. So their crops have wholly or partially failed, and all because of too much cold water in the soil."

Col. Waring says upon the same point: "To the labor and expense of cultivation which fairly earn a secure return, there is added the anxiety of chance; success is greatly dependent upon the weather, and the weather may be bad. Heavy rains after planting may cause the seed to rot in the ground, or to germinate imperfectly; heavy rains during early growth may give an unnatural development or a feeble character to the plants; later in the season, the want of sufficient rain may cause the crop to be parched by drought; in harvest time, bad weather may delay the gathering until the crop is greatly injured, and fall and spring work must often be put off because of wet.

"The above is no fancy sketch. Every farmer who cultivates a retentive soil will confess that all of these inconveniences conspire in the same season to lessen his returns with very damaging frequency; and nothing is more common than for him to qualify his calculations with the proviso, 'if I have a good season.' He prepares his ground, plants his seed, cultivates his crop, 'does his best'— thinks he does his best, that is — and trusts to Providence to send him good weather. Such farming is attended with too much uncertainty — with too much *luck* to be satisfactory; yet so long as the soil remains in its undrained condition, the element of luck will continue to play a very important part in its cultivation, and bad luck will often play sad havoc with the year's account."

Lands that need draining are correctly described as "cold and sour." The excessive quantity of water which they retain, finding no sufficient escape beneath, must escape if at all, by evaporation, a process which abstracts so much heat from the soil and from the air above it as to unfit it alike for the healthful growth of crops and for healthful human occupancy. In the experiments of Dr. Madden on the temperature of such soils, it was found that a well-drained soil was 6½ degrees warmer in summer than similar soil

undrained, while from the experiments of Mr. Parks, it may be questioned whether the difference is not often much greater than this.* Concerning the effect of evaporation in producing this lowering of temperture, Col. Waring speaks thus: "It has been found by experiments made in England, that the average evaporation of water from such soils is equal to a depth of *two inches per month*, from May to August, inclusive; in America it must be very much greater in the summer months than this, but this is surely enough for the purpose of illustration, as two inches of water over an acre of land would weigh *about two hundred tons*. The amount of heat required to evaporate this is immense, and a very large part of it is taken from the soil." At whatever temperature a liquid volatilizes, it absorbs the same total quantity of heat. French remarks, "every gallon of water thus carried off by evaporation requires and actually carries off as much heat as would raise 5½ gallons of water from the freezing to the boiling point."

The drainage of such lands prevents surface washing, leaves the natural interstices between the particles of soil free for the admission of air to the roots of plants, warms the undersoil, permits and promotes necessary chemical changes; gives extra depth and mellowness to the most unmanageable of soils, increases its capacity to absorb moisture from the atmosphere in times of drought, permits its deeper penetration by the frosts of winter, renders it capable of earlier cultivation in the spring, as also of later cultivation in the autumn, thus bringing the seasons into subjection. Experience has also abundantly proven that the increased porosity which the land assumes under this process, greatly increases its power to absorb moisture from the air, and hence enables it better to withstand the draughts of summer.

Another practical benefit of drainage which many Wisconsin farmers can appreciate, is, that it is the best preventive of winter-killing of crops. Concerning this process, Klippart and others explain that where it occurs, there is a stratum of clay or hard-pan too near the surface, through which the autumn rains and melting snows cannot penetrate, and whence, consequently, they have no

* According to French, high authority has placed the difference frequently as high as 15°.

way of escaping but by evaporation, which in winter is very slight. The ground is thus saturated, the plants are confined to short roots, and the heaving-up of the surface soil in the process of freezing draws these from their beds; its subsequent settling down after thawing leaves them exposed, and thus the life of the tender plant is utterly destroyed.

Notwithstanding all these facts, the question of the cost of drainage operations will, other considerations excluded, be the controlling one in determining the extent of its practice. The actual necessary outlay for tiles is trifling, but if the labor, which is the chief item, be counted at its cash value, thorough drainage is expensive. As applied to most lands, it cannot be expected to pay for itself in a year, perhaps not in five or ten years; but work of this kind well done may be expected to last for generations, and should be considered in the light of a permanent investment, safer than stocks or bonds, and sure to return a fair if not an extraordinary interest. To half perform it without competent survey, by digging shallow drains* and by resorting to temporary expedients, is to fail of success even in this. In pioneer life, where land is more abundant and cheap than labor, it is doubtless better economy to superficially cultivate additional acres than thoroughly to improve a smaller farm; this however, is not wholly true of Wisconsin, many parts of which have emerged from this condition so far that the question of the profit of thorough and systematic drainage should be most carefully considered. But there is

ANOTHER ASPECT OF THE CASE,

applicable alike to pioneer life and to advanced settlements, and one which chiefly concerns us as sanitarians. Except for this we should not have ventured upon the presentation of the subject; for, while we are interested in the advancement of agricultural pursuits and in the production of better crops of wheat and corn, we are most vitally interested in the production of better and more

* The best scientific and practical men in England have settled down upon four feet as the minimum depth where practicable. At the same time all admit that in many cases a greater depth than four feet is required by true economy. (French.) The same thing was said by De Serres three hundred years ago.

healthful crops of men and women, and as a rule to which there are few exceptions, we believe that the best physical development and the highest degree of health cannot be attained where we do not have

"PURE AIR, PURE WATER AND A PURE SOIL,"

not one of which is compatible with water-soaked, miasma-generating marshes, or with a soil that is not, either artificially or naturally, drained of the superfluous water that falls upon, or otherwise reaches it. Without exception such soils cannot be considered as other than unsafe for human occupancy.

"The whole tendency of recent investigation proves that the controlling cause of our most fatal diseases is to be found in local conditions," and the evidence that stagnant water, swampy lands and soil saturation rank high among these controlling conditions is beyond all question. In the more palpable cases, neither statistics nor illustrations are necessary to prove the assertion, yet there is a wide-spread neglect to adopt the remedy which, while it would directly conduce to the production of healthfulness, would at the same time usually prove to be the source of large pecuniary profit.

Gen. Egbert L. Viele, an eminent sanitary engineer, in a report made in 1870 on the nature and necessity of a system of drainage for sanitary purposes in the city of New York, says: "It is a well established fact that the principal cause of fever is a humid, miasmatic state of the atmosphere, produced by the presence of an excess of moisture in the ground, from which poisonous exhalations constantly arise, carrying into the systems of those who inhale them a virus which, if not sufficiently intense to produce fever, has such a disturbing effect upon the functions of some organs as to weaken the general system, and act as a powerful predisposing cause of some of the most common and fatal maladies to which the human body is subject. It follows as a matter of course that the first effort to improve the salubrity of any place whatever, should be directed toward preventing the aggregations of water in particular localities, and to remove such as have been allowed to collect."

And the same writer, in a discourse before the American Public Health Association four years later, uses the following yet more

emphatic language: "Of all the problems embraced within the scope of sanitary science none are more important, or should claim a larger share of attention, than those connected with drainage and sewerage; since, of all the innumerable causes which, singly or combined, engender preventable disease, the most wide-spread and most certain is *the presence of an undue amount of moisture in the soil.*"

And again: "We have only to look about us to see on every hand individuals constructing edifices, and communities constructing towns and cities, with a reckless disregard of all the warnings of the past, and an equally reckless indifference to future consequences, in utter violation of those laws and principles upon which life itself depends."

It ought to be clearly and everywhere understood that *there are no more universal causes of disease than those connected with the soil on which men live, and which it is wholly within their power to change from an unhealthful to a healthful condition; that it is never safe to live upon a water-soaked, undrained soil*, and that the tendency of such soil is always to give off malarial exhalations which sap the health if not the lives of those who dwell upon it.

How many are there who know that, during the first half of our civil war, *more than* 20,000 *Federal soldiers died from malarial diseases*, and that this number covered nearly one-third of the total mortality of the United States army for the same period?

How many are aware that the official returns, as given in the Medical History of the Civil War, credit malarial diseases with being the cause of 90,269 deaths, while wounds and injuries received in battle caused only 35,822 deaths?*

The importance of the fact that the best and most skilled sanitarians declare their belief that the emanations from undrained soil give rise not only to agues, which all know to be of malarial origin, but to remittents and typhoids, to rheumatisms, neuralgias,

* The source from which the above figures were taken is the Medical and Surgical History of the Civil War, Vol. I, tables 100 and 112. The diseases selected from these tables as being due to water-soaked soils were the following: Typhoid, Typho-malarial, Remittent and Intermittent Fevers, Diarrhœa, Dysentery, Diphtheria and Catarrh. If to these had been added the many forms of pulmonary disease which may be traced to soil-saturation, the sum-total would have been far larger.

and a whole host of inflammatory diseases, is yet far from being popularly appreciated. The investigations of Dr. Bowditch, in New England, show that a very large percentage of cases of consumption occurred among those who resided upon an undrained soil, and have clearly established the fact that an intimate relation exists between such a condition of the soil and this most fatal of all diseases. The reports of Mr. Simon, medical officer of the Privy Council of England, have also shown that the death-rate from all causes has greatly decreased in many towns in consequence of drainage operations. At Salisbury, fatal cases of pulmonary disease have been reduced to the extent of 49 per cent., at Rugby, 43 per cent., and at Worthing 36 per cent.

But aside from the diseases directly caused by defective drainage, there is the perhaps yet more important and general fact, that life upon a super-saturated soil so insensibly lowers the vitality of the system as to unfit it to withstand exciting causes of disease of any kind. The strong may for a time apparently resist such influences, but the feeble speedily succumb and die. Thus is explained the excessive mortality that accompanies any epidemic which happens to visit such localities, and the fact is well established that such localities invite the approach of epidemics. Mr. Cameron in his Manual of Hygiene gives some very interesting statistics of the mortality from certain epidemics in low lying districts where drainage was impossible, as compared with those of greater elevation. A notable example was the case of the cholera epidemic in London in 1849, when the mortality among the inhabitants living at or near the level of the river Thames was 174 per ten thousand of the population, and decreased with the elevation of the ground with almost absolute uniformity, until, at the height of 350 feet, the death-rate was but six per ten thousand. Dr. Mapother found substantially the same facts in the epidemic of cholera in Dublin in 1866, when three-fourths of all the deaths took place on or close to the sites of obstructed water-courses. Dr. Pinckham, of Massachusetts, has shown that the same state of things existed in an epidemic of diphtheria in Lynn, where eighty per cent. of all deaths occurred in the marshy valleys of low lying districts; in

Lowell, also, "the districts bordering on the river yielded from its water-soaked banks a similar undue proportion of deaths." Indeed, the instances where this law can be shown to have held good are far too numerous to quote, and too conclusive to question, so that it requires no great degree of prescience to foretell what localities in any given district, and what homes in any given community, will be most likely to swell the lists of mortality.

From England, where drainage has been much more extensively practiced than in the United States, and where its effects have been much more thoroughly studied, the testimony in regard to its sanitary influence is of the most positive and direct character. Dr. Chadwick says: "In considering the circumstances external to the residence which affect the sanitary condition of the population, the importance of a general land drainage is developed by the inquiries as to the cause of prevalent diseases to be of a magnitude of which no conception had been formed at the commencement of the investigation. Its importance is manifested by the severe consequences of its neglect in every part of the country, as well as by its advantages in the increasing salubrity and productiveness wherever the drainage has been skillful and effectual." And the General Board of Health of that country, after prolonged investigation, publish the following conclusions as to the drainage of suburban lands:

"1. Excess of moisture, even on lands not evidently wet, is a cause of fogs and damps.

"2. Dampness serves as a medium for the conveyance of any decomposing matter that may be evolved, and adds to the injurious effects of such matters in the air; in other words, the excess of moisture may be said to increase or aggravate atmospheric impurities.

"3. The evaporation of the surplus moisture lowers the temperature, produces chills, and creates or aggravates the sudden and injurious changes or fluctuations by which health is injured."

The subject of Drainage in its Relations to Public Health was made one of special study in the section of State Medicine of the American Medical Association in 1874. Dr. Bell, the chairman, in

his circular letter suggesting the study of the subject, says: "Of all the preventable causes of disease throughout the country, *defective drainage* is unquestionably the most prolific. Directly or indirectly it is the cause of nine-tenths of all the fevers that occur." And from his public address before the association at the meeting referred to, we quote the following statistics:

"The mortality of the United States for 1870 was 492,263. A glance at this tabulated estimate in the census report, will show that about one-half of the total number of deaths were caused by diseases due for the most part to miasms consequent upon soil saturation and stagnant water; that from consumption alone there were 69,896 deaths; from enteric, intermittent, remittent, and typho-malarial fevers, and cerebro-spinal meningitis there were 34,521 deaths. Rheumatism, acute pulmonary affections, croup, diphtheria, and many other diseases well known to be largely due to, or promoted by the same cause, may, for our present purpose, be left out of the count. Of the 69,896 deaths from consumption, and 34,521 deaths from ordinary miasms, three-quarters at the least, or *more than* 75,000 *lives, might have been saved by drainage.*"

The testimony of other eminent physicians on the same occasion, given as the result of careful and extensive investigation, was equally emphatic to the effect that defective drainage was nearly everywhere recognized as one of the chief causes of sickness and mortality both in cities and in agricultural districts, and many instances were given of the improvement which had taken place in public health as the result of drainage operations, whether undertaken for agricultural or sanitary purposes. It is fortunate, indeed, that the two interests seldom if ever conflict with each other, and that the expenditure of labor and money for drainage, entered upon for pecuniary gain, may be expected to result in the increased healthfulness of the drained districts, while drainage for sanitary purposes may equally be expected to result in causing greater fertility of soil. "We believe, without insisting upon its absolute verity in all cases, that it may be taken as an axiom, that wherever drainage of farm lands is found profitable in a pecuniary point of view in the increase and [greater] reliability of crops, it will be

found advantageous as a hygienic measure to all animal life dwelling upon them. If this is the fact, the farmer whose only idea in draining is with reference to increasing, by proper drainage, the product of his acres, is placing upon a surer foundation his own health and strength and that of his family and live stock; and as he enlarges his granaries to receive the increase of the harvest, he is laying up a store of health and strength to draw upon not only in the winter of his days, but during the whole period of his existence." *

"Wide agricultural districts have been so much benefitted by drainage," says Mr. Denton in his excellent work on sanitary engineering, "that diseases which formerly constantly prevailed have now ceased to exist." And Mr. Baldwin Latham testifies that "works of sub-soil drainage that have been carried out in every civilized country in the interests of agriculture, show beyond doubt that both the health of animals and plants is materially benefitted by works of this character." The copious evidence taken by the Metropolitan Sanitary Commission in 1848, concerning the effect of ordinary agricultural land drainage, as practised in England, upon the improving healthfulness of men and the lower animals, and upon climate, resulted in the production of a vast mass of testimony of the most telling character, and clearly showed that all the benefits claimed by the advocates of land drainage had already been fully obtained in English experience.

A suggestion made by Dr. White in a recent article in the Herald of Health, to the effect that the adoption of a general system of drainage would be followed not only by a diminution of disease and an increase in agricultural productions, but by a greatly improved condition of the public roads, is one well worthy of the attention of all communities as an additional reason for, and benefit from the drainage of lands. Nothing is much more common than for roads to be constructed without the slightest effort to drain away the water that in low lands fills the ditches on either side, and such roads are not only frequently impassable but entail annually a very

* Vide Mr. Lyster, of the Michigan State Board of Health, in an excellent article on Drainage for Health. Rept. of Mich. Board for 1874.

heavy tax for repairs, the benefits of which are well nigh inappreciable. No such roads or annual heavy road tax will be found where the drainage of the district is thoroughly carried out.

"It is well known to physicians, and it ought to be appreciated by statesmen," says Dr. Toner, in an address before the American Public Health Association, "that conditions of insalubrity which enfeeble the vitality of a people are much more to be dreaded by a nation than even wars or great epidemics. A region or country noted for unhealthfulness will increase neither in wealth nor in population. The elements which constitute the greatness of a nation are physical vigor, health and enterprise in its population; to have these the rulers must secure good sanitary conditions."

We have written thus far in the hope that by illustrations of the intimate relations that drainage holds both to the profitable cultivation of the soil and to its fitness for human occupancy, its practice might be encouraged and stimulated. Men are proverbially disinclined to recognize conditions dangerous to their own and their neighbors' health in any of their own personal surroundings; if they can be shown that danger does exist wherever there is undrained soil, and that the practice of drainage, while establishing healthful conditions, will at the same time prove a source of pecuniary profit, we may hope for its more extensive observance, and the purpose of this paper will have been subserved.

But whatever argument may be offered for the drainage of water-saturated soil in other localities, the subject viewed in its sanitary relations assumes the most vital importance when considered in reference to

BUILDING SITES

and their immediate surroundings. "Medical and sanitary science and experience alike forbid the erection of dwellings upon an undrained soil. Heat and capillary attraction bring to the surface that dampness which should have been removed by sanitary engineering. The results are malarial fevers, consumption, suffering and death as punishments for neglecting applications afforded by the light of science."* Thus we see that the very warmth to

* Dr. Moreau Morris.

which we resort to dry our dwellings, serves to draw to them the dampness and noxious gases which the experiments of Pettenkofer and others have demonstrated to exist in the soil as the product of the slow decomposition of organic matter. If this be true of the soil, how much more true it is of many of our cellars, where the decomposition of organic matter goes on with great rapidity, resulting in the production of foul gases unfit for human breathing, which yet permeate the air of the whole house, acting, if not as the direct producers of tangible disease, at least as powerful predisposing causes of fatal maladies.

Dr. Lyster justly says: "The difference between sewer gas, now everywhere recognized as one of the most frequent causes of all zymotic diseases, and that arising from the gradual decomposition of vegetable matter in the cellar of the farm house, is rather one of degree than kind." * Drainage and ventilation are the preventive remedies for this evil; yet men blindly persist in tightly closing an undrained hole in the ground which they dignify with the name of a cellar. A great evil in the construction of many houses, lies in the fact that they are built over such cellars and close to the surface of the ground. We believe that it would result in the annual saving of the lives of hundreds of our citizens if every dwelling house in the state were raised to a height of at least three feet from the ground, so that light and air might freely circulate beneath them. Even in the cases where otherwise well constructed cellars are to be found, the necessity for thorough drainage is seldom fully appreciated. Among the questions to which answers are required from the clerks

* The waste heat from the kitchen fire may be made to serve a most useful purpose in the removal and destruction of these gases; to accomplish this purpose, the chimneys of all dwelling houses should be large and built from the cellar bottom, and should also be so constructed that a part, say one third, of their area shall be separated from the remainder by a thin partition. With a sufficient opening left in the ventilating flue thus formed, the warmth communicated to it from the chimney proper will suffice to create a strong upward current which will carry the foul and poisonous vapors far above the dwelling. This method of ventilation may also and with excellent effect be applied to living and bed rooms. The effect will be still greater in cases where more than one fire is maintained. In this case the chimney may have three compartments, the central one serving as the ventilating shaft. Where chimneys are already constructed without the division, and not reaching to the cellar bottom, an imperfect yet valuable substitute for this arrangement is to conduct a stove-pipe from the cellar into the chimney, leaving the bottom open.

of local health boards in their last annual report is this: "What proportion of the dwelling houses in your town, city, or village are either habitually damp, or damp in wet weather?" Out of 367 who returned answers more or less definite to this inquiry, only 83 reply that all the dwellings in their towns are dry, leaving more than three-fourths of all the localities in which a varying proportion of the houses are reported as being more or less damp, and therefore more or less dangerous to the health and lives of the dwellers in them. Some of the replies assert that three-fourths, five-sixths, nine-tenths, and *in no less than nine cases that all the cellars in those districts are in this condition!* Others still, while giving no definite proportions, affirm that "many" "a large proportion," "nearly all," etc., are damp either habitually or at times. It is probably entirely safe to conclude that more than half of all the cellars in Wisconsin are at some season, or through the entire year, wet or damp, and, consequently, in need of thorough drainage. It may and doubtless will be affirmed, that this in some cases is an impossibility; if the assertion be true, the only reply is, that such localities are unfit for the building of human habitations thereon, and should be studiously avoided. Yet if by any combination of circumstances such avoidance is impossible, it is surely the part of prudence in such situations to construct dwellings entirely without cellars, and to raise them well above the surface of the ground, between which and the lowest floor a perfectly free circulation of air should be insured. If this cannot be done, better by far forego any seeming advantage which may accrue from residence in such a spot, and abandon it.

It is not our purpose, however, to do more than to allude thus briefly to the question of drainage as related to building sites, the subject having been discussed by Dr. Marks in the first annual report of this board; neither do we intend to make any reference here to sewerage, further than to call attention to the fact that while drainage has for its distinct and only proper object the removal of superfluous water from the soil, the peculiar office of sewerage is the removal of the waste and filth which are the inevitable accompaniments of life. Both are necessary as well for the

isolated farm house as for dwellings aggregated into villages, towns, and cities, but neither can properly take the place of the other, and the cases in which it is prudent or safe for them to have any common connection or termination even, must be regarded as exceptional. Nevertheless, instances of the violation of this principle are exceeding frequent. Almost as a rule, wherever there is a drain from the kitchen sink of an isolated dwelling it empties into the cellar drain at a short distance from the house, and very commonly in towns, and even in cities of very considerable pretensions, one common drain or sewer receives not only the drainage of all the cellars in its vicinity, but also the discharge from large numbers of kitchen sinks. It should be no matter of wonder if, from the waste and filth of many households thus accumulated in one putrefying mass, highly poisonous gases are generated to find their way back through wholly untrapped drains into cellars, and thence into the dwellings of those whose sanitary surroundings may otherwise be unexceptionable.

And just here it is in place to remark upon the fact that many of the homes of the more careful and better instructed among our citizens are thus immediately subjected to a physical influence of the most undesirable kind, emanating from the dwellings of the more ignorant and neglectful — indeed, from those of the most filthy and careless among our population; from these last are poured into sewers and drains masses of putrescible filth from which are given off foul vapors and pestilence-producing germs of all kinds. Following the laws that regulate the diffusion of gases, these penetrate every side drain and connecting pipe, finding most easy access to the houses which in winter are best provided with the means of producing a warm atmosphere within them; thus by the very means employed to secure comfort, foul gases are drawn into these dwellings to mingle with the respired air, and thus, we are persuaded, may be explained the origin of many cases of sickness otherwise inexplicable. Thus also the filth of one household or neighborhood may contaminate another far removed from and apparently wholly unconnected with it.

Another aspect of the question of drainage is presented when we consider the case of

Land Drainage.

ARTIFICIAL OBSTRUCTIONS.

Not unfrequently even the natural drainage of a country provided by its rivers and other water courses is interfered with by art. The demands of civilization are such that mills and manufactories are usually among the first enterprises undertaken in a new country. Land is cheap and abundant, and for a long time, perhaps, even if a considerable overflowage be caused by the means employed to create the needed power, the interference with other appreciable interests of the country is very slight, if it exists at all. The mill is a real convenience to the people — meets an actual want, and materially assists in developing the resources and promoting the interests of the community. During all this period, the possible sanitary questions that may in the future grow out of the overflowage have hardly been taken into consideration at all, but in the lapse of time the case assumes a wholly different aspect.

Other mills and manufactories may have arisen upon the same stream, so that it not uncommonly becomes necessary to hoard the water for their use in reservoirs or ponds, accumulating in times of abundance a stock upon which to draw in seasons of drought. This involves increased and irregular obstruction of the outflow, and in this way, if not by the original erection of the dam, the level of the ground-water is raised, and much land that otherwise would be dry and healthy is either changed into a swamp, or becomes so water-soaked as to render it much less valuable for cultivation and highly unsafe as a place of human residence. "The evil of obstructions to streams and rivers," says Judge French, looking at the matter solely in the light of its interference with farming interests, "is by no means limited to the land visibly overflowed nor to land at the level of the dam. Running water is never level, or it could not flow, and in crooked streams which flow through meadows obstructed by grass and bushes, the water raised by a dam often stands many feet higher at a mile or two back than at the dam. It is exceedingly difficult to set limits to such a flowage. Water is flowed into the sub-soil, or rather is prevented from running out; the natural drainage of the country is prevented, and land which might well be drained artificially were the stream not

obstructed, is found to be so near the level as to be deprived of the requisite fall by back-water, or the sluggish current occasioned by the dam."

The sanitarian, looking at the effect of this obstruction of water courses, sees, in addition to the common dangers of soil-saturation, the added one that the withdrawal of large quantities of water from the reservoirs in midsummer will leave stagnant pools, and expose animal and vegetable matter, or the more dangerous deposits of sewage, to decomposition at a time when the fever-producing power is at its maximum. The instances of sickness that have been occasioned in this way within our own state, that have come to the knowledge of the Board of Health, have been so numerous as to justify a reference to this matter as a great sanitary evil.

The problem of relief, especially where such institutions have been long established and are under the protection of legal charters, is one of difficult solution, even when the evils caused may be clearly manifest. It would be very far from our purpose or wish to suggest any abridgement of the industrial resources of the state, among which mills and manufactories occupy a foremost position. They are far too valuable a factor in the prosperity of our commonwealth, and too essentially a necessity for the people, to admit of any unnecessary curtailment of their privileges or any needless restrictions upon their development. So far from advocating these, we would extend to such industries the protecting arms of public law and public sentiment, and encourage their increase and multiplication upon every available stream, controlling them only to such extent as is needful for the protection of the public health. And yet it must be said that there is room for more than question, if there are not cases where the interests of an individual, of a corporation or of an industry should be held in subjection to the interests of the community — where neither individuals or corporations should have the right to enjoy a privilege, or maintain a business which abridges the rights of their neighbors or imperils the public health. Gen. Viele relates the experience of a physician who "knew of a case in his own practice, where one mill-dam that did not yield an income of $400 [per annum], had

caused the death of twenty persons." It is to be hoped that there is no parallel to such a case in this state, but it is quite certain that even here in Wisconsin there are cases in which the health of whole communities may be imperilled by the causes here spoken of — that it is an eminently proper question for consideration by our law-makers whether, hereafter at least, the granting of charters for the erection of mill-dams or other obstructions to water courses, of whatsoever nature, shall not be postponed until there shall have been given the most careful consideration to each individual case, and to the sanitary questions which may possibly be involved in it. If it be held that the charter of a water privilege carries with it the implication "that the legislature had in view all the consequences which were to flow from the act they authorized," then these consequences should be well considered in view of the possible grievious injuries to health and life that may result to the many, while the benefits are confined to the very few.

Dr. Edward Jarvis, in an article on the Political Economy of Health, printed in the Report of the Board of Health of Massachusetts for 1874, very forcibly says: "In as far as human life is more important than all financial interests, and even in the financial view, the creative power of human force is more valuable than all created capital, this cardinal interest of the people individually and collectively should take precedence of all other provisions in all legislation.

"Every law, grant or privilege from the legislature should have this invariable condition: that human health, strength or comfort should in no manner or degree be impaired or vitiated thereby.

"When the legislature grants the right to build a dam and flow the waters of streams and ponds, the grantee is held responsible for all the damage that may be caused thereby to lands, crops and other mills. All this is well, for these may be compensated in money; but besides this he should be held responsible that no damage shall be caused to human life and comfort by the changes in the condition of the waters. This cannot be compensated by money."

The dangers to which the public health is subjected from the

overflowage caused by obstructions to the water courses of a region in the nature of dams, etc., has been widely recognized by sanitarians both in this and in foreign countries. In England and Scotland the subject has been actively discussed and has been the matter of special legislation; but in this country little has been done beyond calling attention to it as a thing which, in many places, is imperilling the lives of whole communities. In the older and more thickly settled states, as a matter of course, the evil is more apparent, and the late Dr. Derby, in the Third Annual Report of the Massachusetts State Board of Health has adduced abundant evidence of the production of extensive epidemics by the causes under consideration; some of such extent as to affect many hundreds of people; and the same writer has well said, that "we are not to expect in the midst of civilization, with all the complications that man's industry has woven about us, that water obstructions can be avoided. They contribute to the wealth and prosperity, and therefore indirectly to the health of the people. But it is also well to remember that they are of themselves, and directly, harmful in a greater or less degree, by putting checks upon nature's plan of water purification. There will never be wanting advocates of any application of natural forces which leads to individual or corporate profit, while considerations of public health are always less obvious, and even when plain enough to those who seek them, are of necessity but partially recognized by those with whose interests they conflict. It seems well, therefore, that attention should be drawn to such injuries as are likely to result from interference with the natural flowage of streams," etc.

The plea of necessity for the erection of mill-powers upon sluggish streams and in flat countries, where such obstructions will cause an amount of overflowage and consequent soil-saturation sufficient to make residence near or upon it unsafe, is not in this state a valid one. Wisconsin is abundantly supplied with rivers and streams whose flow is rapid, and upon which ample reservoirs of pure water can be maintained without danger to the health of her citizens.

If in the future our legislators will refuse to grant charters for

the erection of mill-dams, or for any other obstruction to natural water courses, except where the conditions just named prevail, rarely if ever will any real inconvenience be entailed upon the people. We believe that the time has passed when such obstructions to the natural flow of water can be erected with a reckless disregard of all sanitary laws, and that legislative authority to erect a dam, or otherwise to interfere with nature's methods of drainage, should hereafter be granted only after the most careful surveys shall have been made, and with a full consideration of the sanitary questions which may possibly be involved. We believe also that hereafter the boundaries of all overflowage which may be caused by authorized obstructions, should be both clearly defined and carefully protected by law.

SOME OF THE PREVENTABLE CAUSES OF

INSANITY.

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The old adage, that an ounce of prevention is better than a pound of cure, appears to have taken forcible hold upon the thinking members of the community. Individual effort and advanced ideas in certain communities have given preventive measures an impetus unknown heretofore, and with results which could not have been predicted in the "good old times" when the adage was a proverb only.

To-day, the efforts of the advanced members of the medical profession the world over, are in the direction of the *prevention* instead of the *cure* of diseases; and the success thus far attending this departure is such as to warrant the furtherance of this object, if need be, by the power of the law.

Just where the line is to be drawn ultimately between those diseases which may be prevented, and those which may not, it is impossible to predict; but one fact is apparent and that is sufficient for our present purpose; it is, that wherever prevention has been thoroughly and completely tried, no matter whether the effort was directed against small-pox, diphtheria, scarlet fever, yellow fever or typhoid fever, there the disease has been stayed in its progress; these diseases *can not* find lodgment where there is no filth. The time has arrived in the progress of civilization, when it is necessary to impress upon communities the importance, and indeed the necessity, of keeping clean bodies, clean houses and clean cities, if they

would enjoy freedom from disease; that cleanliness will yield healthfulness; that dirtiness will beget disease.

This much may be predicated of disease in general, but what has this to do with the subject of this paper? Whatever diseases are to be ultimately considered non-preventable, insanity is certainly not to be so regarded.

Insanity is a disease which may be prevented in a large percentage of cases both by individual effort, by wise and wholesome laws by a proper training of the mental faculties, and a sound education.

To the proper training of the faculties, not so much perhaps in classic literature as in the laws governing mankind, and to individual effort, self control, etc., we are to look for the most perfect results to follow. Ignorance and apathy are the congeners which favor the spread of disease; these must be removed; the people must be made aware that either or both will spread misery and death in their wake, that universal cleanliness of body, home and town, and a close guardianship of health, will prevent insanity as well as other forms of disease.

Upon what facts are these statements based? If any one interested in the matter will turn to the statistics found in nearly every report issuing from hospitals for insane the world over, they will find in the table of causation a large proportion of cases of insanity caused by some circumstances which may be averted or controlled. Taking at random from among the reports of hospitals for insane for 1878, thirteen reports from as many states, it appears from the table mentioned that 1,236 persons became insane from causes clearly within the power of the individuals to have prevented, this being 28 per cent. on the whole number of admissions. And this is limited to causes, as before said, clearly within the power of the individual to prevent.

This estimate is too low, as the reports themselves indicate, for many were not included in the list who might have been placed there with propriety. Without entering further into a discussion of the general subject, let us for a moment examine some of the assigned causes enumerated and see whether they are preventable or not. The list of causes to which we refer are capable of indefi-

nite division, but they can be just as well grouped and treated together. Among the most pronounced causes we may mention over-work; want of proper food; intemperance and dissipation, and disregard of the ordinary laws pertaining to health. Many cases of insanity may, and doubtless do, have as factors, several of the conditions enumerated above combined; thus, over-work and want of nourishment generally attend each other perhaps as cause and effect; while intemperance, so far as it relates to the abuse of alcoholic stimulants and tobacco, may and often does lay the foundation for either or both the above named causes with many others, for the effects of intemperance are far-reaching, extending even to the third and fourth generations of the descendants of those who are addicted to the habit; not that each successive generation will be necessarily drunkards, but they will suffer the penalty which invariably follows the prolonged disregard of a general law. How does over-work produce insanity? Over-work of any kind, protracted for a length of time, may eventually produce insanity; but to avoid generalities and endeavor to benefit by the examples we meet with daily, let us examine briefly the kind of over-work that brings to our state hospitals those persons who have been been classified as insane from over work.

A large part of the population in the northern portion of this state is composed of persons who have sought a residence in the new world. Elated with the prospect of establishing a home and owning it, they settle in the forest. Ax in hand, their sturdy workmanship opens up a clearing in which crops are to be produced for the sustenance of life and for the accumulation of future wealth. Vigorous health, with prospects of emolument, lends strength to the arm of the young emigrant, and for a time he laughs at prolonged toil, frontier hardships and privations. Through wet and dry, cold and heat, from early dawn until latest dark, hard work, involving the active exercise of almost every muscle in the body, characterizes the laborious daily toil of a class of people who are unceasing in their effort to own the land they settle upon, at no matter what cost to the powers of physical endurance. The few hours of sleep snatched from the daily toil (and this begrudged) is not sufficient to rest the body from the fatigues of one day before another begins,

and the process of wearing out exceeds the process of building up, long before nature intended that it should be so.

For a while all is well, and the draught upon the system is not noticed; but slowly, quietly, this drainage of strength, this overwork, begins to make its mark; the subject not being acquainted with the troublesome hindrances which prevent him from accomplishing as much work as usual, ascribes the difficulty to something else, and keeps on his way until, at last, when his farm is cleared and paid for, he finds, alas! that he is broken down, and his incessant hard work, his disregard for the laws of health, his long defiance to the needfulness of rest, of sleep, now deprive him entirely of the latter, and he sinks into a profound melancholy or hopeless dementia, in which unhappy state he ends his days.

If to this condition we add want of the absolute essentials for the proper maintenance of healthy bodies, by lack of nourishment, another element enters into the case, an element which is even more potent for harm than hard work, and the break down will be more certain and the wreck more complete.

This is not an overdrawn picture — there are now many men and women in our hospitals whose history corresponds almost identically with the conditions above enumerated, who have been brought to their present state by over-work, and want of proper rest and food. It may be asked why this should be so, considering that the life of a farmer is regarded as the healthiest of occupations. Doubtless the farmer's life, so long as it is pursued in accordance with the laws governing life, is one of the very healthiest of occupations, but pursued as described, without proper rest, with no regard to the requirements of the body, disregarding wet and cold, no wonder that rheumatic affections attack the individual and prepare an easy way for the advance of other diseases usually connected with impaired circulation of the blood. It is not the occupation, but the ignorance of how to preserve health, that breaks down the individual.

Each individual is endowed with a certain amount of power; that power or force is maintained by properly balancing all the

bodily functions, and this condition is maintained by performing no more work than can properly be done without making a draft upon the system. As surely as the force called upon to accomplish a certain object no matter what, exceeds the amount the individual can properly yield, just so sure does it take away from the power to resist encroachments of disease; indeed, it hastens disease, and hence shortens life.

The power possessed by each individual is a limited quantity; if the demand exceeds the limit, by just so much is health impaired and life shortened.

Exposure to cold and wet, to excessive muscular strain, and protracted hard labor, predisposes the individual to diseases of the circulation, to "heart disease" and to "nervous diseases," which frequently ends in insanity of a chronic type. The laws governing health and life are immutable and can not be ignored. Every one who imagines himself possessed of greater powers of endurance than his fellow man, deceives himself — he has already opened the door through which disease shall soon stalk, and his boasted prowess makes him an easy prey. Eight hours of hard muscular labor is as much as can be borne properly out of the twenty-four without damaging health. Eight may be spent in light work and amusement, and the balance must be spent in sleep. He who seeks to set aside the rule which time and experience both proclaim to be the best, does so with the positive assurance that he is shortening his own life, by bringing upon himself disease in some form.

Nature is a strict accountant. You may draw upon her resources, if you will, but she will demand back everything she gives; if she is not paid in regular installments the demand will come in bulk, and then only death will satisfy her.

With over-work of body there is usually another troublesome difficulty; it is worry of mind. Although seed time and harvest have continued almost uninterrupted since the world began, there is, nevertheless, among a large class of people a feeling that, perhaps, it will fail this year; if the worry is not about the crops it is about something else. Indeed, there seems to be a growing tendency to worry about everything that concerns life in any of its phases, no

matter whether in the walks of the husbandman, or in the departments of commerce or the professions. Worry and fret, needless anxiety irritate every fibre in the brain and prevents nature from accomplishing her usually even course, so that her work can not be smoothly done; the result is always detrimental to healthfulness, inducing "nervousness," loss of sleep or horrible dreams, and in the end melancholy and insanity.

With many in our community over-work is attended by another fertile cause of insanity; that is, underfeeding. By this term (underfeeding) we not only understand want of sufficient food but also improper food, no matter what quantity is eaten; or, again, improperly cooked food, which was originally good and wholesome. It may appear paradoxical to say that there are many instances of a break down in physical and mental health, occurring among people who live on farms, because they do not have enough to eat, but such is nevertheless the fact; among a certain portion of the community, the haste to get rich leads to little less than starvation in the household. I speak from actual observation, in asserting that insane people are brought to this hospital from large farms which they own, who have denied themselves the requisite nourishment to sustain a healthy body; living upon the most parsimonious diet, that the last grain of wheat may be sold. This is not true of the entire community, but there are people in the community who are accounted "well fixed," of whom it is true. Such cases not unfrequently recover at once, by simply supplying that which they have been deprived of — good food. Food, again, spoiled in cooking is not much better than a limited supply; indeed, is not so beneficial as a limited supply of good food well cooked.

The average stomach in an agricultural community is treated with little respect; it is often made to do duty which would ruin a grist mill or a soap vat, and it is made the receptacle for morsels never intended by nature for the human economy. "Hard bread," and salt pork fried till it is as tough as sole leather, and swimming in clear fat, which is used as a lubricant to the throat, making swallowing a possibility, the only apparent object being to get the

mass into the stomach as rapidly as possible; and this continued three times a day, year in and year out, is not a method likely to strengthen the digestive apparatus, and it certainly does not supply all that the system needs to maintain health. Pork requires a longer time to digest than any other meat when cooked in a proper manner, and when floated into the stomach, a cinder on a wave of fat, the fact is that it does not digest.

Fried meat of any kind is less easily digested than broiled or boiled — but it will not do to digress from our subject, although a chapter might with propriety be introduced on the part played in the production of insanity by unwholesome and improperly cooked food.

A single fact may be mentioned upon this subject, which is, that the great majority of insane people, when brought to the hospital, have some difficulty with the stomach — generally called dyspepsia by the friends, but it often yields to the kindly influences of a generous diet of well cooked food.

It is no unimportant part that this matter of improper diet plays in the production of all diseases. When badly nourished muscles are called upon to do an amount of work which the well fed would fail to do, another element enters into consideration; an element which a little effort, a little knowledge rightly applied, would exclude entirely from the list of causes. No engineer would expect his engine to do full duty upon a half supply of fuel; then if his fuel was green it would seem hopeless to expect any result. Yet there are men, engineers of their own bodies, who require results just as impossible from the human economy, and wonder when the machine breaks down; the wonder is, that it should hold out so long.

To properly sustain all the functions of health, there must be a variety of healthy foods — the bones require one kind of nourishment, the muscles another, and the nervous system still another, and each will deteriorate unless it obtains the particular kind of food adapted to its wants. Some years ago, a very severe form of "nervous fever" broke out in Massachusetts, and afterwards in Michigan. It was fatal in its effects, the fatality apparently being

due to severe spasms; for a long time the cause of this nervous fever baffled every one; but at last it was traced directly and unmistakably to the use of flour made from grain which was spurred, and from what is sometimes called "musty" grain, both unmarketable products — hence used in the household; a disposition of unsalable farm products not unknown at this time.

It is not supposed that the persons who used this kind of flour knew what the consequences would be, but unfortunately ignorance does not exempt mankind from the penalties attached to broken laws. It is our duty to know how to avoid the causes which lead to unfortunate results. Pork often contains the germs of diseases which are loathsome to contemplate; measly pork is another name simply for pork containing tape worms; and the deadly trichina finds within the muscles of pigs a lurking place, waiting only until it reaches the stomach before beginning its work of destruction and death. These latter conditions are not perhaps direct precursors of insanity, but they are precursors of forms of diseases which, if they do not kill outright, leave the system in a condition which favors the development of any disorder which may seek entrance, ending sometimes in insanity.

There is no necessity for this to be so; that it is, can be made apparent to any person sufficiently interested to make peronal examination.

We come now to the consideration of a cause which, for wide-spread energy, must be regarded as the great cause of insanity. I refer to the habitual use of intoxicants. Without entering into a discussion of the moral considerations pertaining to this subject, it is sufficient to say that the habitual use of intoxicants has caused more wide-spread misery, more revolting crime, more disease and wretchedness in every form than any other agent; without moralizing, however, it becomes us to consider the question in a candid manner, unbiased by personal feeling, and accepting results based upon scientific deductions in precisely the same manner as we receive demonstrations on any other subject, and for like reasons; that is, because they are true.

To start with, it may be necessary to ask whether the prolonged

use of alcohol really does have any effect upon the various organs of the body; if so, upon what organs, and how they are affected.

To those familiar with the literature of this subject, it is "thrice to slay the slain," to assert that the prolonged use of alcohol has a direct effect upon the organization, and that its effects are deleterious; indeed, it has been called the "genius of degeneration," so marked are the pernicious effects of the continued use of alcohol in any of its forms upon the organs of the body.

Alcohol is the base upon which all intoxicants in ordinary use rest; no matter whether the beverage is beer, wine, or whisky, it is only a mixture in which alcohol exists in a greater or less quantity according as it is diluted with more or less water.

What, then, are the effects produced by the introduction of alcohol into the system?

We will suppose a healthy man who has never used alcohol in any form. The first symptom noted after the introduction of alcohol, is more rapid action of the heart; this fact has been established over and over again, both on man and the lower animals, and up to a certain extent the rapidity of the heart action increases proportionately with the increase of the quantity of alcohol drank. As a result, the heart is overworked, and when the alcohol is withdrawn the heart flags — does not beat as fast or as forcibly as in health, and exhibits signs of weakness. When the heart beats fast the blood is sent more forcibly through the blood vessels, giving color to the cheeks, indicating that the blood vessels have been filled up fuller than usual; the condition observed in the cheek is only an index of what is going on elsewhere; if it were possible to see the brain and spinal marrow, the same appearance would be noticed, that is, all the vessels are distended beyond their usual size, and by the process they are to a certain extent impaired. This effect is not brought about by the direct action of the alcohol on the heart or blood vessels, but because of its influence on the brain and nervous system first; and the brain being, so to speak, excited by the stimulus, causes the increased action of the heart. So that, (and this is the particular point to which direction should be called), alcohol exerts its power first upon the nervous system. This is

well established, and has been confirmed over and over again by repeated experiments; it is a scientific fact, and stands apart from all moral bearings of the question.

The fact being established that alcohol acts directly upon the nervous system, it remains now to ascertain what results from its continued use. Without attempting to show the successive steps by which the brain and nervous system are affected by alcohol, it is sufficient to say, because of easy proof, that with every potation of alcohol the blood vessels within the brain, and they are to be numbered by the thousand, are distended; this distension continued, causes the vessel to lose its naturally elastic condition and it becomes permanently enlarged, and in time its walls are thickened. After a longer time the tissue of which the wall is made changes into a fatty state, which renders it comparatively soft and easily torn, and it then happens that we have apoplexy and death, or life long paralysis.

Not only does it affect the walls of the vessels, but it changes the very fibre of the brain itself and in much the same way, that is, by rendering the nerve cells fatty, or by shriveling them and wasting away the brain substance.

It must be admitted by every candid mind not biased by a preconceived idea, that an agent, no matter what its name, capable of producing such effects must give rise to disease of some kind.

What those diseases are can be shown by statistical evidence. Still further proof that alcohol enters into the nerve tissue directly, is found by experimentation upon lower animals; the brain being subjected to examination during life, while the animal is under the immediate influence of alcohol. The conditions already enumerated so far as they relate to the circulation of the blood in the brain, then become visible; in several instances the same condition has been observed upon the human subject. Dr. Richardson, a celebrated English authority, once had an opportunity to examine the brain of a man within a short time after death. He says: "A man in a paroxysm of alcoholic delirium cast himself under the wheels of a railway carriage. The brain, instantaneously thrown out of the skull by the crush, was before me within three minutes after the

accident. It exhaled the odor of spirit most distinctly, and its membranes and minute structures were vascular (full of blood) in the extreme; it looked as if it had been recently injected with vermilion injection. The white matter of the cerebrum [the large brain] studded with red points, could scarcely be distinguished when it was incised, it was so preternaturally red; and the pia-mater or membrane covering the brain resembled a delicate web of coagulated red blood, so tensely were its fine vessels engorged."

When large doses of alcohol have been given to animals and then the animals killed, the brain has been found saturated with the alcohol. Dr. Maurice Perrin says that "thirteen ounces of the brain tissue of dogs killed during alcoholic intoxication, triturated with seven ounces of water and submitted to distillation, gave nearly a drachm of alcohol. The same quantity of the blood submitted to the same experiment gave rather less." These experiments of Dr. Perrin confirm researches originally made by Dr. Marcet in 1860 and 1862. Another proof, should more be needed to establish the fact that alcohol acts directly upon the brain, is the condition known as delirium tremens, in which the affected individual sees sights and hears sounds, when there is no cause for either sight or sound except in his own disordered brain — disordered because of the presence of alcohol in the nerve tissue, creating hallucinations of the senses.

Again, the blood which carries the life-giving particles selected for the nourishment of the brain is disordered and disorganized by the use of alcohol, so that it can not supply the brain with proper food in proper quantities. The blood of confirmed drinkers, examined by the microscope, shows that it has undergone changes in its make-up which renders it to a certain extent incapable of properly performing its duties; hence the brain suffers doubly — first from the fact that the alcohol finds its way directly into the nerve tissue, and secondly, because it is not properly nourished by the only agent capable of conveying nourishment to it, the blood which is impaired by the alcohol.

Another fact, based upon strictly accurate data, concerning the susceptibility of those persons who habitually use alcohol, to all

forms of disease, is found in a series of figures taken from "Neison's Vital Statistics," where it appears that intemperate persons have much greater mortality from head and digestive diseases than any other class of people, while the influence upon life itself is very great. Thus the average duration of life in a temperate person

At 20	years	of	age is	44	years.
" 30	"	"	"	36	"
" 40	"	"	"	28	"
" 50	"	"	"	21	"
" 60	"	"	"	14	"

While in the intemperate the chances of living are as follows:

At 20	years	of	age it is	15	years.
" 30	"	"	"	13	"
" 40	"	"	"	11	"
" 50	"	"	"	10	"
" 60	"	"	"	8	"

These deductions are based upon observations made on 357 persons, and is all that is necessary to establish the fact.

It is correct, then, to state that the intemperate use of alcohol is a continued process of degeneration, affecting primarily the brain and nervous system and disorganizing the body, and that it directly shortens human life by many years, through the disorganization it produces of bodily organs.

The organs it disorganizes most rapidly and effectually are the brain and those concerned in the circulation of the blood, the stomach, liver and kidneys, the latter all intimately connected with the proper nourishment of the body, and when diseased they become active agents in the production of disease ofttimes resulting in insanity.

What are the statistics of institutions for the care of insane persons as to alcohol being a cause of insanity? Upon consulting the tables, it will be seen that quite a percentage of yearly admissions are attributable to the habitual use of intoxicants.

Bucknill & Tuke, who are regarded as good authority the world over on the subject of insanity, in their last treatise on this subject give a series of statistics gathered with great care, relative to the

causation of insanity from the habitual use of alcoholic drinks, and they quote from the reports of institutions in different places, thus: In York, England, Dr. Needham reports 22 per cent. of the ascertainable causes of insanity among men due directly to intemperance; Dr. Clouston, a high authority, gives 22 per cent. for men; Dr. Kirkbride, Philadelphia, gives 22 per cent.; Dr. Earle, Massachusetts, gives 20 per cent., but the most remarkable statistics remain to be given.

M. Lunier published an article in 1872 embodying the results of his observations in the several departments of France, showing how insanity increased with the increased production of alcohol. He states that, "while the consumption of alcohol has nearly doubled between 1849 and 1869, the cases of insanity from intemperance have risen 59 per cent. with men and 52 per cent. with women."

In some of the departments where the proportionate increase in the manufacture of alcohol is known, and where accurate statistics are kept, the showing is remarkable. Thus, in those departments which produce alcohol, and where the annual consumption has increased in twenty years from four quarts per head to seven quarts per head, insanity from this cause has risen from 9 to 22 per cent.

In another department, where the annual consumption of alcohol has risen from six pints per head to three quarts per head, insanity from this cause has increased from 7 to 10 per cent.

In one department, where the annual consumption of alcohol has risen from one pint in 1849, and now (1872) is one quart per head, alcoholic insanity has only increased from 7 to 11 per cent.

In the department of the Somme, where but little alcohol is drank, and scarcely so much in 1869 as in 1849, the number of cases of insanity from this cause has remained almost stationary.

M. Lunier also asserts that the increased number of suicides everywhere in France followed the increased consumption of alcohol.

Dr. Sheppard, the author of a work upon the subject of insanity, says of causes: "Without doubt the most frequent of these is intemperance." In his report for 1876, he says: "It is painful

again to allude to the large part which alcoholic intemperance plays in the production of insanity. A careful analysis of the history of the year's admissions clearly establish a percentage of more than 28 as due to this cause. And I am persuaded from the character of the individuals and the form of their malady in other cases, where the causation is not assigned or can not accurately be traced, that an addition of 12 per cent. may directly or indirectly be attached to the same origin. Thus we have an approximate record of 40 per cent. of the madness of Middlesex as due to a preventable cause, and that cause the growing passion for strong drink."

In a little work by Dr. H. Tuke, published this year, entitled "Insanity and its Prevention," the author states that among the causes intemperance unmistakably takes the lead. This is one of those facts which, amid much that is open to difference of opinion, would seem to admit of no reasonable doubt. "Some years ago I calculated the percentage of cases caused by intemperance in the asylums of England, and found it to be about twelve. This proportion would be immensely increased were we to add those in which domestic misery and pecuniary loss owed their origin to this vice. Although tax-payers grumble about the building of large lunatic asylums, it is amazing how meekly they bear with the great cause of their burden, and how suicidally they resent any attempt made to remove by legislation the area of this widespread and costly mischief."

With what singular force these words of Dr. Tuke apply to the same state of affairs in our own country. From the facts I have been able to gather, and from personal observation, I am satisfied that the average as stated above is low enough; that is, for the direct effect of alcohol in the production of insanity. Statistics of the kind are not easily gathered, because the friends of those who are the victims are not always willing to tell all the facts about the intemperate habits of the patient. A curious confirmation of statistics related to this subject is found in the report of Dr. Yellowlees, superintendent of the Glamorgan asylum, Wales. In a recent report, he says, that during the second half of the year 1871 the admission of male patients to that institution numbered twenty-

four, while there were forty-seven and seventy-three in the preceding and succeeding half years. In 1873, during the first quarter, there were ten admissions, while in the preceding and succeeding quarters there were twenty-one and eighteen.

During the same period an experience precisely similar was noticed in the local prison; a less number of persons were admitted as criminals than there had been hitherto or subsequently in the same period of time. In seeking for the cause of this exceptional period, it was found that at that time the population, who were largely employed in coal and iron working, were engaged in a general strike, and that the miners and others having no money to spend for drink were obliged to be temperate, and there was a marked decrease of insanity and crime.

Maudsley says, that if it were possible to strike out at once all insanity from off the earth, it would certainly be reproduced by intemperance in the use of alcohol. I cannot close the remarks on the influence that alcohol has upon the production of disease in a more fitting manner than by a quotation from Dr. B. W. Richardson, in his Diseases in Modern Life. He says:

"There are times in the life of man when the heart is oppressed, when the resistance to its motion is excessive, and when blood flows languidly to the centers of life, nervous and muscular. In these moments alcohol cheers. It lets loose the heart from its oppression and lets flow a brisker current of blood into the failing organs; it aids nutritive changes, and altogether is of temporary service to man. So far alcohol may be good, and if its use could be limited to this one action, this one purpose, it would be amongst the most excellent of the gifts of science to mankind. Unhappily the border line between this use and the abuse of it, the temptation to extend beyond the use, the habit to apply the use when it is not wanted as readily as when it is wanted, overbalance in the multitude of men, the temporary value that attaches truly to alcohol as a physical agent. Hence, alcohol becomes a dangerous instrument even in the hands of the strong and wise; a murderous instrument in the hands of the foolish and weak."

From the foregoing we are enabled to determine from scientific

data without appealing to the sympathies, or dwelling upon the moral side of the question, that a large percentage of the cases of insanity are avoidable from this one factor alone. Now combine this with the conditions which almost invariably follow the continued intemperate use of alcohol—domestic distress, poverty, want of food, unkindness, and, indeed, misery of every description, and what a sea of wretchedness is created in which mankind sinks, drowned in the depths of his own creation. Did it end here, it would be bad enough, but it does not; the habitual drinker invariably stamps his offspring with some form of bodily degeneracy. And so on, the widening stream gathers within its murky waters the unhappy multitude, swept onward to inevitable death of body and soul.

Another preventable cause of insanity is that of heredity. It is asserted upon the highest authority, based upon the statistics of years, that insanity is transmittible from parent to child. Statistics, gathered in all parts of the civilized world, confirm the general statement. England, France, Germany, Austria and America, each and all, have instituted enquiries of this kind, and each have arrived at the same results, although the percentages are not the same in each country, being modified by causes not necessary to explain here.

The statistics of Bethlehem hospital show that thirty-two per cent. of the admissions had hereditary predisposition. In what is known as the Retreat in York, England, hereditary predisposition was traced in one-third of the admissions. Baillarger gives the results of his observation in France as nearly seventy per cent.

Dr. Stewart, of Scotland, places the percentage of cases of heredity in the institution over which he presided at forty-nine per cent. The statistics of the Northern hospital at Oshkosh show that the percentage of cases admitted up to this time, who have inherited insanity, averages thirty per cent.

There is not a shadow of doubt that heredity plays a most important part in the causation of insanity, the least calculation placing it at from 25 to 30 per cent. on the whole number of persons admitted, and there are some exellent authors who make the percentage much greater. The chances of insane offspring resulting

from the union by marriage of persons who have been insane, or who inherit insanity directly, is as great, if not greater, than the certainty of transmitting almost any other disease.

Cases almost innumerable may be cited, going to show evidence of transmissibility, if it were needed, but it is unnecessary; the facts are generally known, the difficulty that presents itself is, how to make mankind heed them. It seems to be well established, that the mother's influence in the propagation of this disease is greater than that of the father; hence, when men select wives it behooves them to be careful whom they select, at least so far as this terrible malady is concerned. I know it is the lover's notion, that matches are made in Heaven; that is poetic, it sounds prettily; but there are those who believe that falling in love is a matter of taste, and depends upon the judgment (or want of it) of each of the contracting parties. The importance of securing, each for the other, a sound, healthful companion would be a great advantage to the world, and save a vast amount of sorrow and distress; but such things are unfortunately not often thought of. Just where society may attempt to regulate this matter it is impossible to say, and, indeed, with this subject we have nothing to do. Our duty is to lay the facts before society, then if they suffer they do it intentionally; they do it in the face of experience, and must abide the consequences.

To a reflecting mind one phase of modern civilization is peculiar. An unusual epidemic disease appears from some cause, probably filthiness, in some part of the country, which operates virulently for a time, and carries off a fifth part of all it attacks. At once assistance in the shape of money, sympathy, all that kindness and consideration can do, is done freely. Every device known to art or science is employed to stay the ravage; laws are passed, state and national legislatures make haste to establish strict rules, hoping to "stamp out" the scourge. This is as it should be. At the same time a scourge more terrible, a malady more dreadful, is fastening its fangs deeply in the vitals of the people; it progresses slowly but irresistibly; it is not confined to one locality, it is widespread as the earth, and where the scourge strikes down its tens, this malady strikes down its thousands, yea, its tens of thousands,

and the stream is ever widening, ever deepening, and no strong hand of law is raised to stop its progress or make the attempt to keep it within bounds; the disease is *insanity*, of which it may be said that one-half the causes are apparently preventable.

There are causes of this dire malady which may not be reached by law — the passions of men allowed full sweep, anger, vicious life, faulty education, hope deferred, ambitions crushed, all aid to bring about those states of body and brain which end in madness; these the individual must battle with alone, and conquer or be conquered as God gives him the strength; these must be made the subject matter for individual education, of individual self-government and discipline. It must be made a part of that universal human reason which Carpenter tells us is progressive, and by which we may hope to secure that watchful self-discipline which will benefit not only ourselves but those who are to come after us, by establishing an intellectual and moral constitution which our children and our children's children will inherit.

There are, however, some things which it would seem might be done by legislatures to help stay the onward march of this disease.

Intemperance in the use of alcohol gives us certainly 25 per cent. of all the cases of insanity; this is a low estimate, much lower than my experience would dictate. Heredity gives us, at the very lowest computation, as many more; there are then from these two causes alone, 50 per cent. of the cases admitted to hospitals for insane which might be prevented. Add to this the insanity induced by other causes, which we have not time to consider now, but which are certainly within the power of individuals or communities to prevent, and the aggregate would soon roll up a mighty army of men saved from a bitter experience. Who can compute the anguish spared; who can estimate the misery, distress, sorrow and desolation avoided; or the wealth accumulated, the happiness, peace and prosperity that would follow the prevention of any considerable part of the number made insane annually by preventable causes.

To remove only a portion of the trouble, would cut away the roots of untold sorrow, would confer a boon upon mankind to be estimated only by Him who holdeth the destiny of the people in the hollow of his hand.

THE INFLUENCE OF

READING UPON HEALTH.

BY PROF. R. B. ANDERSON.
Of the University of Wisconsin.

That vicious and immoral literature has a tendency to poison the mind and heart, and that these in turn, through the passions, act most injuriously upon the physical health, I suppose may be considered as an axiom. That, on the contrary, good wholesome reading, by giving direction to and controlling the passions, has a beneficial influence upon the physical health, is also a truth so self-evident, that no one will presume to question it. The subject in its full extent is an important one, the treatment of which deserves far more ability, time and labor than I can give to it.

Our country is full of a sensational, flashy literature, prepared especially for juvenile readers, which they are greedily devouring. They read about young heroes, who demolish more foes than Don Quixote and achieve more brilliant adventures than the celebrated Baron Munchausen, and finally return home loaded with wealth, to magnanimously forgive their enemies, foremost among whom are their parents. Who can be surprised that such a course of juvenile reading in process of time brings us a beautiful harvest of vice and licentiousness, burglars and murderers. As you sow, so you shall reap.

In reference to what our boys are reading, Prof. W. G. Sumner, of Yale College, contributed an article to the March (1878) number of *Scribner's Monthly*, which gives so able an account of the vi-

cious literature for juvenile readers and its poisonous effect upon the minds of the young, that I make here the following liberal quotations therefrom:

"Few gentlemen, who have occasion to visit news-offices, can have failed to notice the periodical literature for boys, which has been growing up during the last few years. The increase in the number of these papers and magazines, and the appearance, from time to time, of new ones, which, to judge by the pictures, are always worse than the old, seem to indicate that they find a wide market. Moreover, they appear not only among the idle and vicious boys in great cities, but also among school-boys whose parents are careful about the influences brought to bear on their children. No student of social phenomena can pass with neglect facts of this kind, — so practical, and so important in their possible effects on society. * * *

These periodicals contain stories, songs, mock speeches, and negro minstrel dialogues, — and nothing else. The literary material is either intensely stupid, or spiced to the highest degree with sensation. The stories are about hunting, Indian warfare, California desperado life, pirates, wild sea adventure, highwaymen, crimes and horrible accidents, horrors (tortures and snake stories), gamblers, practical jokes, the life of vagabond boys, and the wild behavior of dissipated boys in great cities. This catalogue is exhaustive. There are no other stories. The dialogue is short, sharp, and continuous. It is broken by the minimum of description and by no preaching. It is almost entirely in slang of the most exaggerated kind, and of every variety, — that of the sea, of California, and of the Bowery; of negroes, "Dutchmen," Yankees, Chinese, and Indians, to say nothing of that of a score of the most irregular and questionable occupations ever followed by men. When the stories even nominally treat of school-life, they say nothing of *school*-life. There is simply a succession of practical jokes, mischief, outrages, heroic but impossible feats, fighting, and horrors, but nothing about the business of school, any more than if the house in which the boys live were a summer boarding-house. The sensational incidents in these stories are introduced by force, ap-

parently for the mere purpose of producing a highly spiced mixture. * * * There is not a decent good boy in the story. There is not even the old type of a sneaking good boy. The sneaks and bullies are all despicable in the extreme. The heroes are continually devising mischief which is mean and cruel, but which is here represented as smart and funny. They all have a dare-devil character, and brave the principal's rod as one of the smallest dangers of life. There is a great deal of the traditional English brutality in exaggerated forms. The nearest approach to anything respectable is that *after* another boy has been whipped for mischief done by the hero, the latter tells his friend that they ought to have confessed, but the friend replies with the crushing rejoinder that then there would only have been three flogged instead of one.

Another type of hero very common in these stories is the city youth, son of a rich father, who does not give his son as much pocket money as the latter considers suitable. This constitutes stinginess on the father's part, although it might be considered pardonable, seeing that these young men drink champagne every day, treat the crowd generally when they drink, and play billiards for $100 a game. The father, in this class of stories, is represented as secretly vicious and hypocritically pious. * * * In this class of stories, fathers and sons are represented as natural enemies, and the true position for the son is that of suspicion and armed peace.

Another type of hero who figures largely in these stories is the vagabond boy, in the streets of a great city, in the Rocky Mountains, or at sea. Sometimes he has some cleverness in singing, or dancing, or ventriloquism, or negro acting, and he gains a precarious living while roving about. This vagabond life of adventure is represented as interesting and enticing, and, when the hero rises from vagabond life to flash life, that is represented as success. Respectable home life, on the other hand, is not depicted at all, and is only referred to as stupid and below the ambition of a clever youth. Industry and economy in some regular pursuit, or in study, are never mentioned at all. Generosity does not consist in even luxurious expenditure, but in wasting money. The type seems to

be that of the gambler, one day "flush" and wasteful, another day ruined and in misery.

There is another type of boy who sometimes furnishes the hero of a story, but who also figures more or less in all of them. That is the imp of mischief — the sort of boy who is an intolerable nuisance to the neighborhood. The stories are told from the standpoint of the boy, so that he seems to be a fine fellow, and all the world, which is against him, is unjust and overbearing. His father, the immediate representative of society, executes its judgment with the rod, which again is an insult to the high-spirited youth, and produces on his side either open war or a dignified retreat to some distant region. * * *

The songs and dialogues are almost all utterly stupid. The dialogues depend for any interest they have on the most vapid kind of negro minstrel buffoonery. The songs, without having any distinct character, seem often to be calculated to win applause from tramps and rioters. * * *

These stories are not markedly profane, and they are not obscene. They are indescribably vulgar. They represent boys as engaging all the time in the rowdy type of drinking. The heroes are either swaggering, vulgar swells, of the rowdy style, or they are in the vagabond mass below the rowdy swell. They are continually associating with criminals, gamblers, and low people who live by their wits. The theater of the stories is always disreputable. The proceedings and methods of persons of the criminal and disreputable classes, who appear in the stories, are all described in detail. The boy reader obtains a theoretical and literary acquaintance with methods of fraud and crime. Sometimes drunkenness is represented in its disgrace and misery, but generally drinking is represented as jolly and entertaining, and there is no suggestion that boys who act as the boys in these stories do ever have to pay any penalty for it in after life. The persons who are held up to admiration are the heroes and heroines of the bar-rooms, concert saloons, variety theaters, and negro minstrel troupes.

From the specimens which we have examined, we may generalize the following in regard to the views of life which these

stories inculcate, and the code of morals and manners which they teach:

The first thing which a boy ought to acquire is physical strength for fighting purposes. The feats of strength performed by these youngsters in combat with men and animals are ridiculous in the extreme. In regard to details the supposed code of English brutality prevails, especially in the stories which have English local color, but it is always mixed with the code of the revolver, and, in many of the stories, the latter is taught in its fullness. These youngsters generally carry revolvers and use them at their good discretion. Every youth who aspires to manliness ought to get and carry a revolver.

A boy ought to cheat the penurious father who does not give him as much money as he finds necessary, and ought to compel him to pay. A good way to force him to pay liberally, and at the same time to stop criticising his son's habits, is to find out his own vices (he always has some), and then to levy black-mail on him. * * *

Quiet home life is stupid and unmanly. Boys brought up in it never know the world or life. They have to work hard and to bow down to false doctrines which parsons and teachers, in league with parents, have invented against boys. To become a true man, a boy must break with respectability and join the vagabonds and the swell mob. * * * The sympathies of a manly young fellow are with criminals against the law, and he conceals crime when he can.

Whatever good or ill happens to a young man he should be gay. The only ills in question are physical pain or lack of money. These should be borne with gayety and indifference, but should not alter the philosophy of life.

As to the rod it is not so easy to generalize. Teachers and parents, in these stories, act faithfully up to Solomon's precept. When a father flogs his son, the true doctrine seems to be that the son should run away and seek a life of adventure. When he does this he has no difficulty in finding friends, or in living by his wits, so that he makes money, and comes back rich and glorious to find his father in the poor-house.

The Influence of Reading upon Health.

These periodicals seem to be intended for boys from twelve to sixteen years of age, although they often treat of older persons. Probably many boys outgrow them and come to see the folly and falsehood of them. It is impossible, however, that so much corruption should be afloat and not exert some influence. We say nothing of the great harm which is done to boys of that age, by the nervous excitement of reading harrowing and sensational stories, because the literature before us only participates in that harm with other literature of far higher pretensions. But what we have said suffices to show that these papers poison boys' minds with views of life which are so base and false as to destroy all manliness and all chances of true success. How far they are read by boys of good home influences we are, of course, unable to say. They certainly are within the reach of all. They can be easily obtained, and easily concealed, and it is a question for parents and teachers how far this is done. Persons under those responsibilities ought certainly to know what the character of this literature is."

Books that teach boys to be vulgar, rowdyish and cruel; that teach them to cheat their parents; make them familiar with the life of criminals, gamblers and low people generally; that instruct them that it is necessary to carry revolvers; that show them the way to the saloon; and that hold up before their minds a vagabond life of adventure rather than obedience to parents and teachers, cannot help having a most injurious influence not only upon their minds but also upon their physical health and passions. The tendency of this sort of books is to lead our young men into intemperance and licentiousness and thus to ruin.

But the books and periodicals described by Prof. Sumner are not the only ones that have a corrupting influence upon our youth. There is a large amount of literature of "far higher pretensions" that participates in that influence, and that is more dangerous because the poison is not so easily discovered.

In the first place many of the books in the Sunday school libraries are of a kind of "goody" sort, that, by showing how good little children die poor, crippled, and afflicted in every way, torture

young sensitive minds, and leave them painfully in doubt whether a good life is worth living at all.

Then there are books of the nature of some popular detective stories, that tell of terrible adventures in hovels and dungeons, of hair-breadth escapes among robbers and murderers, and of neck-breaking catastrophes by land and by water. We hold our breath in suspense and our "hairs stand on end," while we read these "thrilling" descriptions. I believe such books tend to break down the nervous system. They make people timid in the dark, and when alone in a house they start at every noise they hear. I sincerely believe that much of the lack of courage that is so prevalent, especially among our most cultivated classes, can be traced back to dime novels, and similar unwholesome stories. And this fidgety, nervous state is certainly evidence of a more or less impaired health.

Many of our frontier stories, notably those which send the young hero out from a bright cheerful home to seek his fortune on the plains, in the mines and among wild beasts, and bring him back a rich and famous man, have a tendency to make the young reader rebellious against authority. He is not content to follow the advice of loving, indulgent parents and teachers, but longs to imitate the example of the hero of his book. At best such reading produces a restless, discontented and feverish state of mind, which is incompatible with a vigorous, healthy, physical growth and development.

Finally, there is a class of romantic, sensational novels, or rather love stories, that ought never to be read, especially by young people. They kindle the passions and develop precociousness. The premature development of the animal passions is injurious to both the man and the woman, even when it does not degenerate into base licentiousness, as is very often the case. Parents should examine carefully *every* novel before giving it to their sons and daughters to read.

If more care and attention were bestowed upon our reading there would be less of anger, less of fear, less of hatred, and less of grief. These are the passions that are the most influenced by what we

read, and these are the passions that act most directly and severely on our physical health. They overrule the reason, and the result is disease.

Instead of this unnatural and highly-wrought fiction, let our young people read *books of travel*, *discovery*, *biography* and *history*. Mythology, folk-lore and ballads will help to nourish and strengthen the poetical side of their nature. Science primers will guide them by easy and fascinating steps into the mysteries of nature, and teach them many valuable lessons of life and living. Works like Robinson Crusoe and Baron Munchausen can be safely recommended, for they do not foster a desire to imitate the hero, and are on the other hand highly amusing. The taste for poetry and the fine arts cannot be cultivated too much, but poetry of the pessimistic order should be avoided. Ambition should be stimulated. It is absolutely harmless, excepting when it is debased by pride, or when it prompts a person to overexert his mental or physical powers.

Again I say, then, that our reading may be made to contribute in a thousand ways to our intellectual, moral and physical happiness, or it may bring about a reel of the passions, unstring the nervous system, prostrate the mind and the body, so that both are lost.

WATER

AND THE WATER SUPPLY OF WISCONSIN.

BY G. F. WITTER, M. D.,
Of Grand Rapids.

In a previous paper we discussed the character of pure water, the distinction between it and what may be called normal water, the effects upon the human economy of certain mineral and organic constituents frequently present in water, together with sundry matters of interest drawn from the reports of correspondents in many parts of the state.

We now propose to resume the discussion then commenced, giving additional facts which have come under our own personal notice in regard to the water supply of the state, facts drawn from communications received since the publication of the above mentioned paper and from other authentic sources, and pointing out remedies which may be easily applied in many instances for the state of things shown to exist in too many parts of Wisconsin, a condition which is producing not only a loss of money serious enough to attract attention in these days of financial embarrassment and distress, but a frightful amount in the aggregate of preventable disease, suffering and death.

Let it not be thought that we are talking at random, when we speak of a loss of money occasioned by the condition of our water supply; it will be shown conclusively, as we proceed, that a large amount of sickness is annually chargeable to this, and to this alone, and that a number of the cases so arising prove fatal. Now, an adult

laborer of the lowest grade is estimated to be worth at least one thousand dollars in cash to the community, and his value increases in a rapidly increasing ratio with the amount of skill or knowledge that he possesses. Let such a one die, therefore, from any preventable cause, and the loss to the community is equal to at least one thousand dollars in cash. Sickness alone, even when not fatal, entails a heavy tax upon the resources of the individual, his family, or the town, during its existence, and thus every case which is prevented represents a certain amount of clear gain.

Reports received in answer to circular No. 5 of this board, from many correspondents, shcw that by far the greater number of our citizens depend for their supply of water, that prime necessity of all life, upon wells of varying construction; common dug wells are probably the most numerous, driven wells perhaps stand next in point of number, and bored wells bring up the rear. This dependence upon wells will probably long continue in the large majority of towns and villages, especially in those where land is comparatively cheap, and which will not, therefore, be for many years closely built up. Hence it becomes a matter of the gravest importance to look carefully after the location of our wells, if we desire to avoid a large amount of preventable disease and death with their attendant suffering.

Of all classes of wells, the common well is unquestionably that most exposed to contamination, and this from a great variety of causes. Privies, sinks, cess-pools, stables, barns, pig-stys, filthy cellars, manure heaps, stagnant pools, all contribute their quotas. When dwellings stand within one hundred feet of each other, their water-supplies are in danger of contamination, from some one or more of these causes, and "eternal vigilance is the price," and in these cases most emphatically the only price at which safety can be insured.

Col. Waring gives forty feet as the least distance within which two lines of drains should be laid in order to drain thoroughly a heavy clay soil, the tiles being laid at a depth of four feet below the surface of the ground. Taking these figures as a basis for calculation, it will be seen that each foot in depth of an ordinary well

will drain a circular area of a heavy clay soil having a radius of five feet, and a proportionately larger area in lighter soils. Estimating the drainage area of a well at only one half of the above amount, and assuming a radius of only two and a half feet for each foot of depth, certainly a very moderate assumption, it will be found that a well twenty feet deep will receive all the drainage from a circular area one hundred feet in diameter, equal to rather less than one-fifth of an acre; while if the radius of five feet be assumed, and, as is seen above, good authority justifies us in so doing, even in heavy clay soils, we shall have a circle of two hundred feet in diameter, with a contributing area of 31,416 square feet, or not far from three quarters of an acre.*

Let any dweller in a town, who may chance to read this paper, draw a plan of the arrangement with respect to each other, of say four or five houses in his own immediate neighborhood, standing at a distance of one hundred feet from each other, locating their barns, privies and other out-houses in their proper relative positions; let him also construct a diagram showing the depths of the privy vaults, cess-pools and the like, and also those of the wells belonging to the several habitations; let him then study from his plan and diagram the probable action of the wells in respect to their drainage capacities, using the figures given in the preceding paragraph as a basis for calculation, increasing or diminishing these figures according to the character of the soil through which the wells are dug, and he will almost certainly rise from the consideration of the subject with more vivid ideas regarding the danger of contamination than any words of ours can convey. It is almost impossible to be safe in using the water of any common well which is surrounded by houses, and in the vicinity of which drains, privy-vaults and sinks empty their contents into the surrounding soil.

From a vast mass of evidence bearing upon this point we select the following cases, only adding that almost every medical journal published contains instances of the same kind, and that all which we present are of recent origin. Samples of the water from nine

* An acre of land contains 43 560 sq. ft., one fifth of which is 8,712 sq. ft. A circular area having a diameter of one hundred feet, will contain an area of very nearly 7,854 sq. ft.

wells in the city of Princeton, N. J., were examined, and five o them were found to contain free ammonia, albuminoid ammonia and chlorides in excess; exactly the conditions of things which, according to the authorities quoted by Prof. Chittenden, shows contamination by decaying animal matter. Tracing the effects of these waters upon the sytems of those using them, it was found that diarrhœa and typhoidal fevers in all cases accompanied their use.

In a little village in Vermont, twenty-eight cases of typhoid appeared in fifteen families, in February, 1878, under the following circumstances: Two years before the outbreak of the fever a gutter had been sunk on the lower side of the main street, running between the roadway and a well, the wall of which was laid bare by the excavation; this gutter received the drainage from several houses on the upper side of the main street, no one of which was provided with a water-closet, while only two or three had drains communicating with the sewer. In the latter part of January, 1878, the water in the well suddenly became turbid during a thaw, but, after the lapse of a few days, resumed its normal appearance and became apparently as good as ever. Shortly afterwards the fever broke out almost simultaneously in fifteen families, all of whom obtained their water from this well, while not the slightest vestige of the disease was seen in any case where the water used came from other and uncontaminated sources.

A point especially worthy of the closest attention is the very small quantity of contaminated water necessary to the production of most serious effects. There are many cases on record similar to that which we are about to quote, which is especially striking as seeming to show that the fever-producing germs may sometimes be subjected to a temperature of 212° Fah. without having their dangerous powers destroyed. Twenty families in the city of Philadelphia had typhoid fever existing in them at the same time, and all of them were supplied with milk from the same source, no case occurring in other families in the same neighborhood who obtained their milk elsewhere. It was found that a case of typhoid existed in the milkman's family, and that the boiler which was used to

heat water for the purpose of washing the milk-cans, was also used to boil the clothes of the typhoid patient. No other connection could be traced, and on this condition of affairs being altered, the spread of the fever was checked.

But it is not necessary to go to New England or Philadelphia to find instances as conclusive and significant as any yet given, and which prove that whatever other means may exist for the spread and propagation of typhoid germs, and it is not questioned that there may be many, contaminated drinking water is among the most efficient. Nor is this the only one, or the most formidable of the disorders, the origin of which may be traced to the same cause.

Turning to the report of this board for 1877, we find detailed cases of typhoid fever, diphtheria, cholera morbus, "a peculiar sequel of which was gastric and visceral irritation, lasting two or three weeks," scarlet fever, remittent fever, "complicated with cerebro-spinal symptoms," diarrhœa and dysentery, attributed by the skillful and cautious observers who report them to such causes as these: Water supply drawn from "wells situated in yards in which hogs and cattle are fattening for market." "Wells which are polluted by the pigs, chickens, cows, and, perhaps, also by the inhabitants of the cabins." "The general absence of pure water for drinking purposes." "Contaminated water-supply." The use of water "entirely from cisterns without efficient filters." "Improper water for drinking and culinary purposes." "Using very foul water obtained from a hole in the ground, only four feet in depth." Certainly in the physical world as in the moral, in the laws of the body as well as in those of the spirit, God is not mocked with impunity; whatsoever men sow, that, and that alone, do they reap.

From answers to circular No. 5, received since the publication of the last report, we select the following cases: A report from New London says: "In one family where three of the children had typhoid fever, and where some members of the family were sick all the time, when called to attend them with fever, I found the privy not twenty feet from the door or well. I had it removed, and, since the recovery of the fever patients, they *all* have enjoyed

the best of health. This I regard as a typical case of poisoning from the privy."

Dr. Hubbell, of Medford, writes thus: "Several instances of families being below par in health have come under my notice, where I suspected the filtration of slops thrown near the wells had contaminated the water, as shown by Heisch's test, and a change of the water-supply has restored them to health."

Dr. Davis, of Baraboo, contributes the following: "In one instance a well just back of a dwelling house, in pretty close proximity to a privy, a barn and other outbuildings, became foul from filtration, and the consequence was five cases of typhoid fever in persons who used the water from the well. Three of these cases terminated fatally and two recovered."

From Manitowoc, Dr. Pritchard gives this: "In one family the whole of the members were subject to intestinal disorders, which were cured by changing the drinking water. In this instance the water was loaded with organic matter, not only from kitchen slops but from privy and cess-pool. The proprietor has constructed a sewer and discontinued the use of the water from that well."

Dr. Riddell gives the following opinion concerning the state of things at Chippewa Falls: "There is no doubt that much contamination occurs to drinking water in wells here by surface washing of foul matters into them in the spring. There are a great many wells in the lower city [the waters of which], I am satisfied from personal observation, are not fit to use for drinking purposes on account of [the presence of] organic matter."

Thus it will be seen that all the conditions required to generate disease of the most virulent character are present in Wisconsin, as well as in Europe and in other portions of the United States. And not only does death lurk in our wells and springs; some of our rivers, too, already vie with those of the older and more thickly settled parts of Europe in their evil fame.

From a report made to the common council of the city of Milwaukee upon the drinking waters of that city, published in July, 1878, by O. W. Wight, M. D., health commissioner, we quote the following: "Some of our shallow wells only reach down to the

upper red clay. The waters of these wells are very bad. Other wells penetrate deeper to the lower red clay. The waters of these are not good, but by no means so bad as the first. * * * The first class of shallow wells, or those that reach only to the uppermost layer of clay, are little better than cess-pools. They receive the surface water which is impregnated with slops, offal, stable manure and the contents of privies. The second class, or those that descend to the gravel bed between the upper and lower sheets of red clay, are very much better. They receive water which has been partially filtered. Yet, in most cases, the surface water drips down into them, poisoning them more or less according to the conditions of the locality where they are found. * * * The numbers of these shallow wells run up into the thousands. Many of our people are still dependent upon them for water. All of them are dangerous, some of them extremely so."

Speaking of the rivers which flow through that city, Dr. Wight says: "The Milwaukee river water in the city, where it receives the sewage from sixty or seventy thousand inhabitants, is more dangerous than the waters of the shallow wells."

And again: "Among the dangerous waters is that afforded by rivers to which sewage gains access. The three rivers running into the city are all of this class. They flow through populated regions, and drain cultivated lands. They traverse considerable villages where they receive the manure of stables and hog-pens, the offal of slaughter-houses, the refuse of manufactories, the garbage of habitations, dead animals, and the contents of privies. Within the city, the Milwaukee river receives the sewage from more than half the population of the town. From North street to the lake it is a public nuisance of the worst kind."

Similar testimony is borne by Jas. Johnson, M. D., in a paper quoted in the report of this board for the year 1876.

A prolific and, in most if not in all cases, a wholly unsuspected source of disease is to be found in the wells in school-house yards, from the waters of which fifty thousand children must quench their thirst during school hours. These wells are too often so located as to receive surface drainage, and they are frequently the receptacle

for sticks, old boots, leaves, dead frogs and mice, occasional cats and various other articles similar in character which mischievously inclined boys may think proper to deposit therein. They remain, moreover, unused and stagnant during a considerable portion of the year, and if they are properly cleaned out once in the course of two or three years, it is thought a most praiseworthy exhibition of zeal for cleanliness.

How often do we hear that diphtheria or scarlet fever, or both together, are raging fearfully and fatally among the children of a certain school district, being almost wholly confined to the children attending that particular school! In many such cases we are firmly convinced that the cause will not be hard to find, that the truth will be found at the bottom of a well. We call upon school directors, teachers, parents, all concerned to look well to the danger which may easily arise from this cause. Look after the school yard wells. Do not poison your children with foul water and then charge their sickness and death to the mysterious dealings of an inscrutable Providence.

To the evidence that we have already adduced of the fact that there are in our midst causes of disease, suffering and death which ought to be, and which can be removed, it is needless to add anything more. If we have not already shown that there are grave evils everywhere prevalent in our present condition of water supply, we despair of doing so by any proof at our command. It now remains to point out the remedy for these evils, to show the means whereby they can be done away with.

It is true that the remedies we have to propose are in some cases costly, but life and health are of more value than money.

The remedies are of three classes; 1st. Those that lie within the power of individuals; 2d. Those that must be reached by the action of communities, villages, towns and cities; and 3d. Those which call for the exertion of the sovereign power of the state.

Before proceeding, however, to the discussion of these remedies, let us inquire what ought to be the standard of purity for the water supply of any community, and how persons possessing ordinary intelligence, but no special chemical knowledge, may know whether that standard is really attained.

Water and the Water Supply.

It has already been shown that an absolutely pure water is nowhere to be had, nor is it perhaps desirable that it should be. Taking, therefore, a normal natural water as our standard, let us inquire into its characteristics. It should be clear and transparent, without perceptible color, odor or taste; free from any suspended matter, and should give a lather readily with a moderate quantity of any good soap. We add a few directions by which anyone of ordinary intelligence can obtain a sufficiently accurate notion of the character of a given sample of water with a moderate expenditure of time and trouble.*

Obtain a bottle or flask of clear white glass, of about a quart capacity, and as thin as possible in the sides. Fill it with the water and hold it in front of any dark colored or black surface so that a strong light shall fall upon it from above and one side. Under these circumstances, any small particles of suspended matter are readily seen. Care, however, must be taken not to mistake minute air bubbles for suspended particles of matter.

Note next the color of the water by placing the flask or bottle in front of a white wall or other surface (a sheet of fine drawing paper answers well for this purpose), and compare it, if practicable, with a bottle similar in size and shape containing distilled water. Rain water, if caught after rain has been falling for several hours, in a clean vessel and at some distance from any building, answers equally well for this comparison. Very slight differences in color can thus be noted. The two flasks should stand side by side in good diffused light; light reflected from a white wall or screen is well adapted to this observation. If the water should be found to contain any large quantity of suspended matter, or to exhibit any very decided tint or color, it is safe to reject it for drinking purposes, at any rate in that condition. It may be practicable to render it fit for use by filtration or other means, of which we shall treat in due time.

Observe next the odor, if any; to do this with advantage, fill a perfectly clean, wide necked bottle of a pint or half pint capacity about one third full, shake it up well and inhale the air above it.

* Wanklyn & Chapman, as quoted by Dr. E. Smith.

Should any disagreeable smell be noticed the water is probably unfit to drink. Warm the water in the same bottle slightly and smell it again; a moderate degree of heat will often render perceptible an odor when none can be observed if the water be cold.

Place next about a pint of the water in a clear glass bottle, add from a half teaspoonful to a teaspoonful of pure white sugar, cork it up tightly, shake well until all the sugar is dissolved and stand the bottle for twenty-four hours in a warm place. If, at the end of that time, any turbidity, milky appearance, any disturbance of the transparency of the water, any appearance of fermentation or any disagreeable odor is noticed, the water should be rejected without hesitation. Water sufficiently pure for drinking ought, under the above named test, to show no perceptible change at the end of forty-eight hours at least.

Further tests, however, should be made before a sample of water is pronounced in all respects fit for use in its natural condition. All the material and apparatus hitherto mentioned are to be found in almost every house. To carry our examination further requires a little more. A few grains each of caustic potash, iodide of potassium and nitrate of silver, together with a few drops of sulphuric acid and a little starch, constitute the means for making a few tests which, taken in connection with the preceding, enable us to form a very correct idea of the character of any water.

Add a very little caustic potash to the water, and observe carefully whether it develops any odor; whether any insoluble substance makes it appearance, and if so, whether much or little, together with its color. A pungent smell will be perceived if ammonia be present; a colored precipitate probably shows the presence of iron, while a white precipitate would probably indicate magnesia.

Make now a little thin starch water and dissolve in it a few crystals of the iodide of potash; when these have thoroughly dissolved add to the solution a few drops of sulphuric acid; if any blue color appears, the test is unfit for use and must be thrown away and a fresh portion prepared with better material. If no effect is produced by the mixture, a little of the acidified and

iodized starch may be poured into the water to be tested and the resulting effect noticed. If any darkening should be apparent, the water can hardly be pronounced fit to drink, and the deeper the tint produced the worse the character of the water.

Finally, a crystal of the nitrate of silver dissolved in the water should not impair its transparency in any very marked degree. A slight cloudiness is not an indication of any serious contamination, but any decided amount of precipitate is to be regarded as suspicious, particularly if it grows rapidly dark in color in daylight.

By the use of the tests detailed above, we are enabled to decide upon the presence or absence of any ammonia or ammonical salts, nitrous acid or nitrites, any undue amount of chlorine and any putrescible sewage. These being absent, a water may be pronounced safe for domestic use with a reasonable degree of certainty; while any water which does not bear examination in the manner described should be rejected and a better one found.

We now come to the consideration of the means by which some of the evils we have spoken of may be avoided, and first to the consideration of those that lie within the reach of individual members of the community. To point out the evil in many cases is also to point out the remedy. Where the proximity of a privy, a stable or some similar source of defilement is the cause of foul water, the removal of theso, or better the filling up of the well and the construction of a new one with the use of all needed precautions against contaminating its water, are the obvious means to be employed.

And just here let us offer a word upon the use of a material for curbing wells which, as it seems to us, has many advantages to recommend it. Pipes made of vitrified stoneware are now manufactured of very large size for the purpose of constructing sewers, and are warranted to stand any pressure likely to be brought to bear upon them by the weight of the soil, pavement, travel upon the streets under which they are laid, etc., etc. They can be fitted together in any required length, and the joints made as impervious to the entrance of surface drainage as any other portion of the tube. A well carried to a sufficient depth thus curbed, properly covered

over, for no well should be left uncovered to the air,* and provided with a proper pump, would be as nearly perfect as any such arrangement can be made. It is true that its first cost might be considerable, but the work, thoroughly done, would be done for more than one or two generations, to say nothing of the consideration that health and life would be far safer in the use of water from a well thus constructed than in the use of that from wells open to receive all manner of abominations from the top, curbed with pine boards, which must decay in the course of a few years at the utmost, and receiving the soakage and leachings of all the filth surrounding it in the soil — a well such as that examined not very long ago by an eminent chemist, who pronounced its waters to be worth about two dollars a ton as manure!

The substitution of earth closets for privy vaults is also a measure the adoption of which cannot fail to be attended with excellent results so far as concerns the defilement of wells. This is not the place to speak of their many advantages in regard to the health of our people, but we look upon the general employment of these excellent arrangements as offering one of the best means for preventing the contamination of the soil and the consequent pollution of our wells, in what is certainly the most objectionable of all possible ways.

The use of bored and driven wells is also to be recommended, provided that a sufficient depth is reached in both cases, and provided in bored wells that use is made of a proper tube through the whole depth of the bore. Vitrified tubing, with properly cemented joints, as above described, seems a proper material for such use.

In view of the number of driven wells already in use in various parts of the state, and of the fact that so far as is known no experiment has been made and placed on record by disinterested authority for the purpose of determining the correctness of the prevalent opinion that no surface drainage can reach and contaminate the water furnished by these wells, the following experiment was devised and carried out.

A well tube was driven down into the drift and underlaying clay

* Vide case reported by Prof. Chittenden.

to the depth of twenty feet below the surface and a proper pump connected therewith. One pound of ferrocyanide of potash was then dissolved in a gallon of water, and the solution thus made poured into a funnel-shaped cavity surrounding the tube; a quantity of the crystals of the same salt was then buried just below the surface in close proximity to the tube, these arrangements being completed at 3 o'clock P. M. on the 8th of October, 1878.

The reasons for the selection of the above named salt were these: 1st. That its detection in small quantities was easy, its reactions being characteristic; and 2d. That it was not likely to be found in any natural water.

A heavy rain set in while the arrangements were in progress and continued through the night. At 9 o'clock the next morning (October 9th) thirty-two ounces of the water was drawn from the tube and carefully tested by means of copper sulphate; no evidence of the presence of the potassic ferrocyanide appeared, and the remainder of the thirty-two ounces was then evaporated until only four ounces remained, and the residue, thus concentrated, examined as follows: A small watch-glass, being cleaned with care, was placed in a strong light upon a dead white surface; a small fragment of copper sulphate was then placed in the glass, a few drops of the water poured upon it, and the whole examined by means of a powerful lens; no evidence whatever was seen of the characteristic reaction produced under such circumstances when the ferrocyanic salt is present. Similar examinations were made on the 10th, 11th and 12th of October, respectively, without detecting the ferrocyanide.

On the 12th, the idea suggested itself that a condition of things might possibly exist in the soil which had rendered the whole experiment futile; that the ferrocyanide might have suffered decomposition by means of the oxide of iron naturally present in the soil or derived from the tube. To test this question, a quantity of the clay through which the tube passed was obtained and packed as tightly as possibly in a glass jar, and a quantity of sand placed on top; a wire to represent the tube was then passed down through the sand and clay to the bottom of the jar, and some small crystals

of the salt mingled with the sand. The whole was then saturated with water and allowed to stand for twenty-four hours, at the expiration of which time a careful examination was made to find any Prussian blue that might have been formed. None was seen, and it was then determined to carry the experiment with the jar a step further. A fresh portion of clay was taken and moulded to fit the bottom of the jar; being then carefully taken out, some parts of it were carefully shaved off in such a manner as to leave a small space vacant at the bottom of the jar, when the clay was again replaced; another layer of clay was placed on the first and packed tightly around the sides of the jar, and the other arrangements completed as before. The vacant space was now carefully watched to observe whether any water percolated into it; none was seen, nor upon examination at the end of seventy-two hours could any evidence be obtained of the presence of the ferrocyanide in the cavity at the bottom of the jar.

This experiment is thought to be complete so far as it goes. It is not claimed for it that it is quite decisive of the question of surface water penetrating to the water furnished by a driven well, inasmuch as a larger quantity of the salt might have been employed, for example, ten or twenty lbs. instead of one or two, or some salt furnishing decided spectroscopic indications, and known to be absent from the water in question, might have been used. It seems, however, to be tolerably certain that when a tube is driven to a sufficient depth, particularly when it penetrates a bed of clay of some thickness, contamination from surface drainage is not greatly to be apprehended, and that the general opinion concerning the advantages of driven wells is so far correct.

It may happen that good and wholesome water is not to be had by digging; that the district is underlaid by such conditions as to shut out all hope of obtaining it by means of any well of reasonable cost, curbed, bored or driven. In such a case there are two resources within the reach of the individual; the first is the construction of a proper cistern of sufficient size and the use of rain water. An adult needs about one half gallon of water daily for drinking; and for washing and miscellaneous purposes, about

twenty gallons more will be required. In several American and European cities, the amount of water furnished per diem for each individual ranges from thirty to one hundred gallons; with only moderate economy, twenty gallons per diem would probably be a sufficient allowance, or one hundred gallons per diem for a family consisting of five members; and calculations for a cistern should not be based upon any allowance much smaller than this.

A gallon contains two hundred and thirty-one cubic inches, hence one hundred gallons will occupy a space of about fourteen cubic feet. A cylindrical cistern seven feet in diameter and eight feet deep will contain a little more than twenty-three hundred gallons, or a supply of water sufficient for a family of five persons for all purposes for about three weeks. To aid still further in making the necessary calculations, the following figures are given: The annual rainfall over the whole state of Wisconsin is stated to be thirty inches, about one-fourth of which falls in the spring, three-eighths in summer, one-fourth in autumn, and one-eighth in winter. The least amount falls along the shore of Lake Michigan, and the greatest in the southwestern portions of the state. One inch of rain will give sixty-two and three-tenths gallons upon one hundred square feet of surface, hence thirty inches will give eighteen hundred and sixty-nine gallons. Or upon the roof of a house measuring forty by twenty feet, having a roof surface of eight hundred square feet, one inch of rain will give four hundred and ninety-eight and seven-tenths gallons, and thirty inches, fourteen thousand nine hundred and sixty-one gallons, or enough to fill such a cistern as the one mentioned above about six and one-half times in each year.

Thus it will be seen that a sufficient amount of water falls from the clouds to furnish an ample supply for domestic use, if only proper means are taken to collect and store it.

Every cistern built for this purpose should be provided with an efficient filter, and, of these useful appliances, it would seem that a larger variety is offered for sale in Europe than in America. Sanitarians seem to be very generally of opinion that the best filters yet made are those which utilize the remarkable oxidizing powers

of animal charcoal, of which the forms are numerous. One, which finds considerable favor abroad, is placed in the path of the water as it enters the cistern, which is itself tightly closed to prevent the entrance of any extraneous matter; yet another is placed at the cistern opening of the pipe from which drinking water is drawn, the water being used for other purposes in its unfiltered condition. The first position seems for many reasons the better. In some cases a double cistern is constructed: one a large receiver, the other smaller, connected therewith, the filter being placed between the two, and water drawn only from the smaller.

Space fails us in which to enter upon the proper manner of building cisterns for storing drinking water. We can only say that they should be of stone or well cemented brick, preferably wholly subterranean, and provided with a sufficient man-hole for the purpose of cleaning them out when it may become necessary, which with a proper filter will be very seldom; at all other times the man-hole should be tightly closed.

The second method to which reference has been made, by which pure water can be obtained by a single family, is one the mention of which will alarm a great many, and call up before their minds a vision of complicated apparatus, pipes, boilers and furnaces; we refer to distillation, and this will insure the transformation of water otherwise wholly unfit for any household use whatever, into one which, after proper æration, is as pure as is attainable in the most favored regions, and fitted for any purpose whatever. Nor is the necessary apparatus at all complex or more difficult of management than a tea-kettle; a tea-kettle, in fact, would make a very respectable means of distilling water, and we can easily conceive of circumstances in which the use of water thus purified might be the cheapest and most practicable thing to be done.

All that is requisite is a boiler, which may be so constructed as to stand upon an ordinary cooking or other stove; in the cover of the boiler a tube should be inserted representing the spout of the tea-kettle; this tube should be prolonged to a condenser, which may be any water tight keg or barrel, its size varying with the capacity of the boiler; in this keg or barrel as great a length of

tube should be coiled as possible, and this end should be furnished with a stop-cock, and brought out near the bottom of the barrel, and the apparatus is complete. It is scarcely necessary to say that all connections should fit as tightly as possible, although no great pressure is to be provided for. To use the apparatus, a sufficient quantity of water is placed in the boiler, which is set on the fire, and the connection made with the condenser; this should then be filled with cold water, which will require renewal from time to time as it grows warm, some convenient vessel set under the stop-cock to receive the water as it flows out, after which all that is needed is to keep up sufficient fire, and replenish the boiler from time to time, which may economically be done from the warm water removed from the condenser.

In order to remove the "flat taste" disliked by persons who are not used to drinking distilled water, a few grains of common salt and chalk may be added to each gallon of water before using it; it should also be ærated by pouring it from one vessel to another.

When it happens, as it has already happened, and will happen with greater and greater frequency in the future, that the soil of a given district becomes so contaminated that the water falling upon and passing through it becomes so charged with organic matter as to render its further use dangerous, it then becomes the imperative duty of the village, town or city to take measures for providing a full supply. In Wisconsin, there would seem to be little, if any, difficulty in doing this at a comparatively light expense. All along the eastern part of the state, Lake Michigan stretches its waters, offering an abundant supply for a larger population than can ever occupy its shores; in the central portions the Fox, Wolf, Wisconsin, Black and Chippewa, with their thousand tributaries, furnish resources; while north and south are found numberless smaller streams and lakes of naturally pure and good water; and from all these sources it is easy to obtain a supply as good as any to be found elsewhere in the country.

But our town and village authorities owe to their citizens a present pressing duty. In 1872 or '73, the State Board of Health of Massachusetts caused an investigation of the private wells

and similar sources of water supply to be made, with the unwelcome result of discovering that the greater number of such sources throughout the state were either already contaminated or so situated as to be in danger of contamination by sewage alone.* It is hardly possible that so bad a condition of things yet obtains in Wisconsin, but the investigations of Prof. Chittenden and the reports of correspondents of the committee on Water Supply and of the Board generally, seem to show that matters are already bad enough, and that it is time to look earnestly for a remedy.

Our town and village authorities owe to their citizens the imperative duty of protecting existing sources of water supply against contamination. They can and ought to prohibit the use of water drawn from wells or cisterns within certain specified distances of privies, cess-pools, stables, etc., or, better still, prohibit absolutely the construction of any of these except under such conditions and restrictions as will render the fouling of any source of water supply an utterly impossible thing. Not only the character of our water but the general health and longevity of our citizens will be improved by such restrictions, and even if no right exists to protect people from the consequences of their own ignorance or carelessness, no moralist will deny that the right certainly exists to protect the careful and intelligent against the consequences of recklessness or folly not their own, and against which they are powerless to protect themselves.

The advancing tide of immigration is rapidly increasing our population, and as a necessary consequence, our soil must become more and more contaminated with every coming year, and therefore more and more unable to act beneficially upon the waters which it contains. Hence arise certain duties in regard to our water supply in the future, which no power other than that of the state can properly perform.

In England, the attention of the government was forcibly drawn to the pollution of its streams and rivers by the fearful results of

* Our authority for the above statement is the Medical Record of New York of date March 2, 1878. We endeavored to obtain a copy of the Mass. State Reports for those years, but were unable to do so.

the cholera epidemics of 1849 and 1854. "The city of London is supplied with water by eight companies, five drawing their water from the Thames, two from the Lea, a tributary of the Thames, and one from an artesian well in the chalk. In 1848 and '49 all of these companies delivered unfiltered water, drawn from points in the rivers at which all of the sewage impurities poured into the streams were to be found, and absolute proof, it may be said, was had that the severity of the epidemic at that time was due to the impurity of the water then furnished. A law was passed by which the companies were compelled to draw their supplies from a point above tide-water and above London, and also to filter the water before delivery. The cholera visitation of 1854 found certain parts of London supplied under the improved system contemplated by the law, while still other parts were using the impure and unfiltered water, some of the companies not having effected the required changes; and this epidemic was much more malignant and fatal in these latter portions of the city than in the former, other circumstances being as far as possible equal in the cases selected for comparison. But this was not all. A third cholera epidemic appeared in 1866, and attention was attracted by 'an explosion' as it was called, from the sudden and fearful number of deaths in a district supplied by one company. This company drew water from the river Lea, which, during a part of its course, received the sewage of a large population. It was ascertained that to the mixture of a certain amount of unfiltered, and in other respects impure water, with the ordinary supply, the violence of the epidemic was to be ascribed. It was believed that some fecal matter from cholera patients had found its way into the Lea, but however this may have been, the fact remains that while impure water had often been mingled with the usual supply and produced an imperceptible effect, yet, when an epidemic existed, the same cause produced fearful results." *

Judging from the experience of older states than our own, both in Europe and America, the time is not far distant when our rivers, streams and lakes must furnish the principal supplies of water for

* The foregoing is condensed substantially from the Mass. B. of H. Rept. for 1876.

our citizens, and of these, very many as yet are sufficiently pure and wholesome for that purpose. Indeed, large numbers of our people, especially in the lumbering districts, use these waters now in preference to any other. It therefore becomes the duty of the state to take all the necessary measures for preserving these waters from contamination as far as that may be practicable. The American Medical Association, at its annual meeting in 1876, adopted unanimously a resolution * declaring it to be "the first duty of states and municipalities, first in importance and first in the order of time, to make a sanitary survey of the water supply, to preserve it against all unnecessary and avoidable contamination." Dr. Kedzie also laid down among others, the following propositions, as true as they are forcible, and they received the general assent of the section of the above named learned body before which they were discused: 1. Uncontaminated water is the right of every one. 2. Needless pollution of water is a crime against society. 3. Water in streams, lakes, etc., is common property, and no one has the right to destroy or injure its potable quality.

To-day is our accepted time; already a very large portion of Wisconsin is stripped of its forests, and the land that has thus been laid bare is being inspected with a view to its future profitable employment. It is a trite thing to say, that before many years the now waste places of the state will be dotted over with farms, mills, manufactories, around which villages, towns, cities will grow up, and all of whose operatives must be supplied with good and wholesome water before all things else. The power of the state alone is adequate to secure them this prime necessity; the supply is now ample and good enough to meet all reasonable demands; let us take care that it be not polluted beyond all hope of reclamation, as has already been done in many of the older states.

Many a town has found its wells growing unfit for use, and has been obliged, in self-defense, to build expensive aqueducts, by which water has been brought for miles, to bore artesian wells at a great cost, of which the water has sometimes proven unfit for drinking after it had been obtained, or finally to erect extensive filter-

* Offered by Dr. R. C. Kedzie, of Michigan.

beds for the purpose of partially purifying the water which flows past them and which they have themselves defiled. Let us be warned by many such experiences and be wise in time.

Such frightful pestilence as has recently devastated the south may not visit us, but others of as severe a character may, and we ought to prepare to meet them — to meet them? We ought to be so well prepared that, even though a case or two may be found brought from elsewhere into our borders, no pestilence can obtain a foothold amongst us. Let us not fold our hands and sit down in idleness bewailing the severity of God's judgments on the land; God's judgments indeed they are, but upon sins of the body, sins from the consequences of which there is no redemption, the penalty of which is always exacted to the uttermost, and falls too often upon the innocent as well as the guilty. Cholera, small-pox, scarlet fever, diphtheria, measles, are no respecters of persons; if anything seems to be known of these dread destroying angels, it is that they work by the spreading of minute germs which start into life, and, after the law of all life, reproduce their kind whenever and wherever they find a proper soil wherein to grow. While we are seemingly doing our utmost to provide such a soil by leaving our sewage to take care of itself, to filter through our porous soils into our wells and springs, carrying with it these germs of deadly growth, while worse, if worse can be, we drink water drawn from wells separated from privy vaults and cess-pools by only a few feet of earth, and from holes in the ground only a few feet deep, dare we expect to be saved from the ravages of pestilence? Will not pestilence rather be the fruit of our own doings?

All over the land there is springing up a desire stronger than ever yet our country has felt for the beautiful, — a desire, strenuous and eager, that will not be denied. Everywhere, earnest, true and thoughtful men and women are preaching the duty of making our every-day surroundings attractive to the eye; we are urged to plant flowers in our gardens, trees before our gates, to hang pictures upon our walls, to cultivate beauty in all ways and for its practical value as well as for its own sake. All this is right and proper, but let it be remembered that all the beauty with which we can sur-

round ourselves will not prevent the burning heat of fever, the agonizing cramps of cholera, or death by suffocation in diphtheria; that any one of these may enter a home where the choicest works of art decorate the walls, where gems from the sculptor's hand stand on massive pedestals, the rarest flowers give forth their fragrance, and trees the most stately overshadow the entrance, while yet in the rear the privy and cess-pool are found close to the well, their foul contents filtering unchanged through the soil and poisoning every drop of water drawn, so that thus the cool draught, the delicate article of diet prepared, perhaps, with loving skill and tenderest care to tempt the palate of the sick one, may be the vehicle of death instead of life.

Let us look to these things first. Let us learn ourselves and teach our children to guard the source of our water supply against even the slightest pollution, be it of whatsoever kind it may. Let our springs and wells be sacred as those found in the desert, around which no danger is to be feared, where the lives of friend and foe alike are safe. Let him who wantonly pollutes a stream of water, be held "guilty of a crime against society," and be adequately punished. Let us strive to render our brooks and rivers types of that seen, alas! as yet, only in apocalyptic vision! "A pure river of the water of life, clear as crystal, proceeding from the throne of God."

NOTE.—In the preparation of the foregoing article, we have been under many obligations to Prof. T. W. Chittenden, to whom credit is due for the accounts of chemical operations and tests, condensations from various reports and periodicals, etc., etc.

SUMMARY OF REPORTS.

In answer to circular No. 5, on Water Supply.

Answers to questions contained in the above circular have been received from the following gentlemen, in addition to those hitherto published:

L. G. Armstrong, Boscobel; W. H. Bartram, Fort Howard; A.

W. Bickford, Richland Center; B. C. Brett, Green Bay; R. Broughton, Brodhead; H. B. Cole, Black River Falls; J. N. Cook, Necedah; W. W. Daniells, Madison; J. C. Davis, Fort Atkinson (2); M. M. Davis, Baraboo; N. M. Dodson, Berlin; E. Ellis, Ashland; W. A. Gott, Viroqua; T. W. Haight, Waukesha; S. B. Hubbell, Medford; G. Hutchinson, Durand; G. W. Jenkins, Kilbourn; W. Kempster, Oshkosh; J. J. Leavitt, Fennimore; I. Manley, Markesan; D. Mason, Prairie du Chien; J. R. Moore, New London; W. F. Nichols, Menomonie; H. H. Parrott, Douglas Center; B. O. Reynolds, Geneva; S. S. Riddell, Chippewa Falls; G. M. Steele, Appleton (2); M. Waterhouse, Portage (now dead); A. H. Weld, River Falls; R. M. Wigginton, Watertown; O. W. Wight, Milwaukee; G. D. Wilber, Mineral Point; and besides these, one or two have been received which bear no signature.

Extracts from many of the above communications have been printed elsewhere, and the following synopsis is given here as presenting, in a condensed form, a large amount of valuable and interesting information:

Nineteen correspondents report the principal source of water supply in their respective localities to be wells and springs. Nine report wells and cisterns, and the remainder, with few exceptions, speak of wells only. Lakes, rivers, fountains and artesian wells are mentioned in some cases as furnishing a portion of the supply. One only reports that cisterns are used to any great extent.

No complete system of water supply is reported from any locality, nor any complete system of sewerage. A partial system of water supply is to be noted in two places, and partial systems of sewerage in five; these partial systems of sewerage appear to be the result of private enterprise in all cases. A majority of our correspondents give no answer at all to the questions upon these subjects.

The depth of wells in different localities is reported to range from three feet to nine hundred and sixty-one feet. Three correspondents give the average depth in their neighborhoods at fifteen feet; five report it at twenty feet, and three at twenty-five feet. Two state the average depth at less than thirty feet, while depths of

thirty, thirty-two, fifty and sixty feet respectively, are given each by one writer. The following ranges in depth are reported also, each by one correspondent: three to eight feet, six to ninety feet, eight to one hundred feet, twelve to twenty feet, eighteen to sixty-five feet, twenty to thirty-five feet, twenty to forty feet, twenty to sixty feet, twenty to seventy-five feet. Two mention twenty to fifty feet, while the depth of artesian wells is set down as ranging from 100 to 961 feet. Eight correspondents do not answer the question at all.

Twenty-two replies state that hard water prevails in the localities to which they refer; four only that soft water is used, and four others say that both qualities are found. A few do not touch upon the subject.

A single affirmative answer only is given to the inquiry whether rain-water is used to any extent, against fifteen negatives. More than half of the letters received do not refer to this question in any way. One writer only affirms that any system of filtration or purification is employed in his neighborhood, and adds, "with advantage." Twelve answer negatively, and the remainder not at all.

The responses in relation to the distance of privies and cess-pools from wells, etc., are generally very full; no correspondents fail to give some reply to one or both of the questions upon this subject. Two or three give rather indefinite answers to the question, "What is the average distance between privy and well?" "Good distance," "Not near," "A fair distance," are some of these; the last being given in answer both to the question just detailed and to the question, "What is the least distance observed by you between privy or cess-pool and well in your neighborhood?"

Of the remainder, eight give the average distance at fifty feet, two at thirty feet, two forty feet, and one twenty feet only. Two place the average at over seventy feet, while the following ranges are given each by one writer: twenty to one hundred feet, twenty-five to ninety feet, thirty to seventy-five feet, fifty to seventy-five feet; two to three rods; three to eight rods; four to five rods; five to six rods; ten to twelve rods. Average distance of from two to

eight rods, and four rods are named by two and three correspondents, respectively.

Five feet is the least distance observed as existing between cesspool and well, while in *no less than three instances* privy vault and well are removed from each other a distance of ten feet only. "Twelve feet apart" is the answer from two correspondents, sixteen feet of the same number, while no less than nine report the minimum observed distance as only twenty feet, and seven replies, not including any of those previously mentioned, name two rods (thirty-three feet) or less as the least distance known to their authors.

From the replies to the question concerning disease arising from contaminated water, copious extracts have been given elsewhere; of the remainder, four give no reply to the question, and thirteen say that no such case is positively known to them. Many, however, who answer in this way are careful to limit their replies to their own immediate experience, while others still are careful to guard their negatives from being too broadly construed; one says that "many such cases are reasonably suspected," and a very few answer "no," without any qualification.

No case of disease is reported as originating in water contaminated by the vicinity of grave-yards, nor is any instance noted in which the water of a district has been affected by such a proximity. Two samples of water came under observation, however, one, elsewhere reported, undoubtedly so contaminated, the other showing strong reason for suspicion that such was the case, which suspicion was confirmed by the history of the well from which it came.

Metallic pipes are reported to be in use more or less extensively in fifteen districts, the material being iron in ten, and lead in five cases. Eighteen correspondents know nothing of such pipes being used, and the remainder give no answer to the question.

Three answers only say that any analysis of water has been made in the district; three correspondents do not note the question.

A fact to be regretted is that so few seem to have complied with the request to have the simple test described in the circular made.

Twelve gentlemen, however, have done so in instances numbering from two to thirty. It is to be remarked of these that the greater the number of samples tested the greater the inclination becomes to pronounce well-waters bad; thus, where two specimens have been thus tested the answers are "good" or "passable," while, where twenty or thirty have been examined, the majority give the character of the water as doubtful or bad. In one instance, a correspondent at first confidently answered that the water in his district was undoubtedly good and pure, but a short time afterward sent another note in which he said that, upon applying the test to a number of waters drawn from various wells in his neighborhood, every one showed signs of the presence of putrescible sewage. In several cases only the fact that the test has been made is stated, no results being given.

To the question whether open springs supply water to any extent, ten answer affirmatively, twenty-one in the negative, and the remainder return no response at all.

The questions whether any special cases of contamination have been observed either in the water of a district or in isolated instances, whether water has been contaminated to any extent by decay of wooden curbing, oxidation of metal pipes, etc., or by the use of Paris green, are very generally answered in the negative. The only exception to this are four affirmative answers to the first of these and two to the second.

Answers to the remaining questions are omitted as being of insufficient general interest to require publication.

In conclusion, it is our pleasant duty to thank very heartily and sincerely the gentlemen who, at some inevitable cost to themselves of valuable time and labor, have given us such full and accurate knowledge of the subject of our water supply; the value of the service they have thus rendered to the people of the state cannot be over-estimated, if, indeed, it can be estimated at all. To make visible to all the foul "Dwellers on the Threshold," more real and terrible than any that the artist's imagination has ever conceived, to show the unsuspecting and the ignorant how to avoid their attacks, to prevent the germination of the seeds of death which they

scatter thickly everywhere, these are labors the value of whose results are above all price, labors on which any man may well be proud to enter.

It is greatly to be regretted that our space does not admit of the publication in full of the valuable papers received in answer to our circular. We believe, however, that we have omitted nothing of importance in their contents, nor have failed to mention the name of every correspondent not heretofore published, and having thus done our best, we are fain to hope that all "will be therewith content."

AN INVESTIGATION OF THE

DRINKING WATER OF A CITY.

BY PROF. THOS. W. CHITTENDEN,
OF GRAND RAPIDS.

In a paper printed in the report of the Board of Health for 1877, we called attention to certain conditions of the present water supply of the people of the state generally, and to some dangers threatening the public health arising from those conditions.

Since the publication of that paper we have made a careful examination of the wells, springs, etc., from which a small city near the center of the state draws its supplies of drinking water, having in view a double object: 1st, to learn to what extent and by what means these sources have been already or may be contaminated; and 2d, to trace out, if possible, any connection existing between the occurrence of certain diseases, as scarlet fever, typhoid fever, diphtheria, etc., and the use of contaminated water for drinking purposes.

The investigation has more than a local interest, from the fact that all the conditions existing in the city in question are to be found in every one of a hundred or more of the smaller cities which lie scattered all over the state. In all of them the system, or rather want of system, by which the people are supplied with the very first necessity of life is the same; in all the same sources of contamination are to be found, and in all, we fear, the same needless and costly sacrifice of life and health has been and is continually made.

The localities in which contamination seemed most likely to occur, were first carefully noted, and then from a number of such

points samples of water were taken for examination. The results of the analysis will be given below.

A cause of contamination is often to be seen which is frequently, if not wholly, overlooked, but which we think can be shown to be powerful for evil: we refer to the use of the refuse of lumber mills, slabs, edgings, etc., for the purpose of filling up ravines or gullies, grading roads and the like, a use which is very general in the city to which this paper refers, and in all parts of the state in which the lumber manufacture is carried on to any extent. Instances are not uncommon in which a thousand cords or more of this material have been employed to make a solid road bed, now over a ravine, again along the bank of a river, while in other cases, where a road is carried over a creek, or other small watercourse, the whole "bottom" is filled in with this refuse, only a small channel being left open through which the water of the stream may flow.

Now, let it be remembered how rapidly wood will decay under such conditions, how large a proportion of the products of its decay are soluble in water, and how far water will flow through a body of soil without being deprived of its dissolved organic matters, and we think it will be admitted that such accumulations constitute a source of contamination to many sources of water-supply, both present and prospective, by no means to be overlooked or neglected.

As was stated by Dr. Witter, in his paper upon "Water" in the report of 1877, absolutely pure water does not exist in nature, nor does it appear that it would be a desirable thing to use even if it were always and everywhere readily procurable. As usually found, it holds certain substances in solution, some gaseous, some solid, some indispensable to the building up of both animal and vegetable tissues, some which contribute to its purification by combining with and thus rendering innocuous much matter that otherwise might be productive of injury. Water too, like the air we breathe, holds in suspension particles without number of solid matter — particles precisely similar in character to "the gay motes which dance in the sunbeam," which may be rendered visible in exactly the same way,

and of which it is almost impossible to get rid. Even water which has been distilled away from all contact with atmospheric air, and that which has been carefully filtered, is full of these particles, and no method has ever been devised by which water may be wholly freed from their presence. The nearest approach to perfectly pure water which has ever been recorded, was made by Prof. Tyndall by the use of extraordinary precautions to insure the cleanliness of the apparatus employed, and even then that eminent philosopher declared himself unwilling to say that no suspended particles were present — that, in fact, the presence of very many was highly probable.

The task of the chemist is thus seen to be confined to answering the question: What proportion of these solid matters contained in water is injurious to health? To this question, he is at present able to return a tolerably definite answer; it is entirely true that there is a limit to his power; he can not say of any given sample of water: "This will, if taken into the human system, produce typhoid fever or diphtheria, or that is certain to be absolutely harmless;" but he can say, with a great degree of certainty: "This is contaminated with decaying vegetable matter, that with decomposed animal substances, and either can be used for drinking purposes only at great risk of health or life." He can determine with marvelous accuracy the presence of certain mineral constituents, read the combinations in which they exist, and can determine whether a given sample of water probably came from a pure or from a foul source. Before laying before the reader the results of our work, it may be that it will interest him to know something of the work itself — something of the delicate processes by which the above mentioned results are achieved, and the methods of reasoning upon which the chemist's conclusions are based.

In all natural waters, as has been said, some solid matters are held in solution; the most important of which are lime, magnesia, soda, potassa and iron; these are usually combined with carbonic, sulphuric, nitric, nitrous, silicic, and phosphoric acids; in addition to these, ammonia and chlorine are very generally present. Nor are these all; in many natural waters iodine, bromine, lithia,

strontia, and various other bodies are known to exist; these, however, are usually in such minute quantities that their effect upon the character of the water, or upon the general health of those who drink it, can not be noted, if indeed it have any effect whatever, and hence the analyst's attention is generally confined to the substances first named, together with such metals as lead, copper, iron, and very rarely some others. Of those substances to which special attention is given, some are more important than others; thus the hardness of water depends upon the quantity of lime and magnesia present in it, and, while it seems to be generally admitted that a moderately hard water is better for drinking purposes than one which contains no hardening constituent at all, it is thought equally certain that an excessively hard water produces some disorders unpleasant in themselves, and at times exceedingly difficult to cure; the determination of the quantity of lime and magnesia, therefore, is one point to which considerable attention is given.

Again, in almost all water, traces of nitric and nitrous acids are present, and by a trace is meant a quantity sufficient to give a distinct sign in answer to the delicate tests employed by the chemist, but too small to be weighed or otherwise measured. These acids are compounds of nitrogen and oxygen, the constituents of the air we breathe, which may be caused to combine by a powerful electrical discharge; hence, rainwater is very apt to contain traces of both, and water which has fallen during a thunder storm is almost certain to do so; but if more than a very slight trace is present, it is a suspicious circumstance, for both these acids are among the results of the decomposition of animal matter, and their presence, especially when another nitrogenous body, to be hereafter spoken of, is also found, is of the gravest significance. Chlorine, too, engages the analyst's attention. This substance is usually found in water in combination with sodium, forming common salt. Now, since salt appears to be an absolute necessity to human life, it would seem, at first sight, to be a matter of very small consequence whether we take it as seasoning to our food or dissolved in the water we drink; but salt forms one of the principal mineral constituents of all the excrementitious products of the human body, being found in the

tears, perspiration, urine, etc., and therefore its presence in large quantity, gives reason for suspecting contamination of the most objectionable kind.

The methods for detecting all the substances as yet specially mentioned are of the simplest and most certain kind. Lime and magnesia may be determined together, by means of a standard solution of soap in alcohol, and the result stated in "degrees of hardness;" or the lime may be first removed by oxalic acid, and the magnesia, if any, then determined by one of two ways, the one by converting it into pyrophosphate, an insoluble salt, the other by the soap test above referred to. For detecting nitric acid, a strong solution of ferrous sulphate (copperas, or green vitriol) is employed, while "Price's test," which depends upon the reduction of iodine, and its union subsequently with starch, serves for the detection of nitrous acid. Chlorine is always detected by means of silver nitrate, with which it forms a compound having very characteristic properties.

But the attention of chemists has long been turned to the discovery of some means whereby the quantity of organic matter could be measured with ease and certainty; several methods of doing this have been devised, but found lacking in one important particular or another, and thrown aside as worthless.

The earliest method consisted in evaporating a given quantity of the water to dryness in a platinum vessel, and carefully weighing the residue; this was then heated to redness and maintained at that temperature until it was judged that all the organic matter had been destroyed, when it was again weighed and the loss set down as organic matter. This primitive way of operating, which we believe is still practiced by a very few old-school chemists, was soon seen to be wholly untrustworthy; not only was the organic matter destroyed, but much of the inorganic also, and hence it was not unusual to find a water set down as containing a large amount of organic matter which really contained very little.

Following this, came what is known as the permanganate process, which is still used when no very great accuracy is required, and in such cases is capable of giving very good results. It depends upon

the fact, that the well-known salt, permanganate of potash, contains a large amount of oxygen which it holds very loosely, and hence gives up very easily to any readily oxidized body; thus if we have a solution of the permanganate of known strength, we can readily calculate the amount of oxygen contained in it, and hence can calculate also the amount of oxygen required to burn up any organic matter that may be present in a given sample of water, and, from the amount of oxygen thus consumed, form a pretty accurate opinion of the quantity of the organic matter. But, besides organic matter, some other body capable of taking oxygen from the permanganate may be present, and before any reliance can be placed upon the results thus obtained, the absence of such bodies must be proven, or, if they are found present, their quantity must be ascertained and proper allowance made for it — sometimes by no means an easy task — or they must be removed, and the risk again incurred of removing with them some part of the organic matter.

Two other methods only remain; the one introduced by Frankland & Armstrong, the other by Wanklyn & Chapman. Frankland's process follows the first described method in evaporating a known quantity of the water to dryness, first, however, destroying any nitric or nitrous salts present by the use of sulphurous acid. The residue after evaporation is carefully collected and submitted to ultimate analysis after the method usually employed, i. e., it is burned in a combustion tube, oxygen being supplied by chromate of lead or oxide of copper; the products of combustion are carefully collected and weighed, and the amount of organic matter thus estimated. The objections to this method of operating are, first, that it is laborious and demands a very high degree of skill in manipulation; and second, that the limit of error is as large as the whole amount of nitrogen present in a fairly good sample of drinking water, there being room for doubt whether all the nitrogenous salts are destroyed, and almost a certainty that some of the organic matter is lost during the preliminary evaporation.

Wanklyn's method seems to have sprung from the permanganate process already described; its peculiarity is that it operates upon the organic matter without evaporation, renders its destruction cer-

tain if all the operations are properly conducted, and enables the chemist to estimate its amount with great accuracy and to give a fairly correct opinion of its source.

With all these advantages, besides that of requiring only a reasonable amount of skill in its performance, it is not surprising that this process has almost wholly superseded every other, and is the one employed at the present day by the large majority of chemists in England and America, in fact, to use Dr. Frankland's words, "almost universally." It is known as the ammonia process, and depends upon the fact that when nitrogenous organic matter is heated, in contact with a strongly alkaline solution of permanganate of potash, it is converted for the most part into ammonia, and, other things being equal, the proportion of ammonia yielded is so constant that the results of various operations are strictly comparable.

Chemists have long known that in order to obtain water sufficiently pure for many of their operations, it is necessary to reject the first portions which come over in the process of distillation, and also to stop distilling long before all the water in the still, or retort, is exhausted; both the first and the last portions distilled containing more or less ammonia. If, now, 500 cubic centimetres of water be placed in a retort and heat applied until 50 cubic centimetres have been distilled over, 75 per cent. of all the free ammonia dissolved in the whole quantity of water will be found in this 50 cubic centimetres; and if the distillation be carried a little further, the water in the still will be entirely deprived of its dissolved ammonia.

This having been done, all the organic matter originally present remains in the still, and if a measured quantity of a solution of permanganate of potash which has been rendered strongly alkaline by the addition of caustic potash or soda, be poured into the still, upon the recommencement of the distillation, ammonia will again be found in the water coming over, and may be measured by appropriate means. We have several tests for the detection of ammonia, one of which* is so exceedingly sensitive that it is difficult to obtain water sufficiently pure for its preparation; another, the one employed in Wanklyn's process, is almost equally delicate and very

* Bohlig's test.

characteristic in its reaction. It is known as Nessler's test, from its discoverer, and "consists of a solution of iodide of potassium saturated with periodide of mercury, and rendered strongly alkaline by means of caustic potash;" when this is added to a solution containing ammonia, a brownish yellow coloration is produced which becomes deeper as the proportion of ammonia becomes larger, thus furnishing a very ready means of judging with great precision of its quantity.

In Prof. Wanklyn's work on water analysis, the operator is directed to test for ammonia at four separate points in the course of each analysis, and further examination is declared to be an unnecessary refinement. In our own work, however, we have not found this to be the case; it is quite true that in the case of free ammonia, three-fourths of the whole amount present was found with remarkable constancy in the first 50 cubic centimetres, but, after concentration and the addition of the permanganate, we have never found the distillate free from ammonia until 200 cubic centimetres have passed over, and we accordingly made it our practice to look for ammonia at five points instead of four in every examination.

The most careful attention to perfect cleanliness of all apparatus used is imperatively demanded in the above described method of analysis; this being given, the results are remarkably accurate and comparatively easy of attainment. They are stated under two heads: free ammonia and albuminoid ammonia, the latter representing the organic matter.

Working in this way, we examined water drawn from several points in and around the city referred to in the beginning of this paper. It may be well here to say that waters may be divided into three general classes, with reference to the quantity of albuminoid ammonia yielded when they are subjected to the method of examination just described: 1st, Waters of extraordinary purity, yielding less than .05 parts per million of albuminoid ammonia. 2d, Waters sufficiently pure for ordinary purposes, yielding not more than .10 or .15 parts per million, and 3d, Foul waters yielding a larger proportion than this of albuminoid ammonia. None of the samples examined by us can be placed in the first class; several of the river

waters and one or two spring waters belong to the second, while nearly or quite all of the well waters fall into the third class, and must be pronounced unfit for drinking purposes.

We have said that the ammonia process of examining a given sample of water enables the chemist to pronounce with a reasonable degree of certainty upon the source of contamination, or rather to distinguish between animal and vegetable matter; the reasoning upon which he bases his conclusions in this respect is as follows: An important constituent of urine is urea, a substance giving rise by decomposition to carbonate of ammonia; if, therefore, upon distilling a specimen of water we find it to contain a large proportion of free ammonia, and upon further examination discover also considerable chlorine, we may feel pretty certain that it is contaminated by animal excretions; one specimen which we analyzed seemed to be, indeed, little better than dilute urine. Again, if but little chlorine is found and little free ammonia also, while the addition of the permanganate solution causes the production of a large amount of albuminoid ammonia which is given off slowly, seemingly almost with reluctance, we may be satisfied that we are dealing with a water contaminated by decaying vegetable matter. A water containing a large proportion of chlorine and also yielding much albuminoid ammonia, is probably contaminated with decaying animal matter; and this conclusion is strengthened if we find in addition much nitrogenous matter oxidized to nitrous or nitric acids. In one instance we found this condition of things, and besides, strong indications of phosphoric acid; the water came from a spring flowing out of a low bluff upon which stands a grave-yard, disused only within a few years; the distance from the nearest grave to the point at which the spring flows out of the sand is not more than fifty feet, and to us the evidence of contamination from dead bodies seemed so conclusive that we published a card in the local papers warning the citizens against further use of water from the spring in question.

As yet the limits suggested in the preceding paragraph mark the boundaries of the chemist's power; he cannot say at present that the germs of typhoid, or scarlatina, or diphtheria, do or do

not exist in any given water, but he can say that this or that water is loaded with the products of decay from animal or vegetable sources, and hence is more liable to be the cause of disease and death than another which contains no such filth.

We now proceed to give the results of our investigations: At the first point which claimed attention, stands a house in which three cases of scarlet fever have occurred; the well here is in close proximity to a stable and similar out-buildings. At a second point close by is a case of some interest; three fatal cases of scarlet fever have occurred here in two families who have successively occupied the house, now vacant. It seemed probable, therefore, that here must be some local circumstance which rendered the disease peculiarly malignant, and the well was therefore examined with great attention. It is very shallow, and receives surface drainage under the following circumstances: to the north and east stretches a marshy piece of ground, drained partly by a little stream, and partly by a little ravine or gully which crosses the road just north of the house. The water from this well gave no evidence of chlorine or free ammonia, but contained two hundred and fifty-two parts per million of albuminoid ammonia, thus giving evidence of the presence of decaying vegetable matter in great abundance.

Leaving this place we find the water generally good for some little distance, the wells being dug down to the level of the river, from the waters of which they draw their supplies, as is shown by the fact that no water is obtained until that level is reached. The soil through which the water filters to the wells is a mixture of sand and kaolin clay, the latter predominating; now it is a property of clay well known to the chemist, and sometimes of advantage to him, that it absorbs ammonia and precipitates much organic matter in virtue of the alumina which is one of its constituents; hence, water which has filtered through a large body of clay is often remarkably free from organic matter and the products of its decomposition. To this cause is probably due the good character of the water in the wells of this district generally, and the small number of fatal cases of disease, two deaths being noted as occur-

ring here out of a total of fifty-four cases, while at other points the percentage of deaths was far larger.

A little to the east of this locality is the spring above referred to as flowing from a cemetery; its water gave ninety-six parts per million of free, and four hundred and eighty-four parts of albuminoid ammonia; Price's test showed the presence of considerable nitrous acid, and phosphoric acid also was shown to exist in it. No case of disease is known to be due to the use of this water, which fact is probably owing to the circumstance that no household supply is drawn from it; it has a certain reputation, however, with some who consider it a mineral spring, and use its waters for their supposed medicinal and " magnetic " properties.*

To the south of this spring is a locality where many cases of disease have occurred with a large percentage of fatal results. Here a very large proportion of the wells were found to be contaminated by privy and stable drainage; in one case the well stands between the house and the stable, which are not more than twenty feet apart; house, stable and privy, in fact, occupy the corners of a triangle, the longest side of which is not greater than forty feet! Close by stands a dwelling in which three deaths have occurred from scarlatina; fourteen cases of this disease alone, besides several others of diphtheria, having appeared in this immediate neighborhood. In one case the water drawn from the well showed a large amount of flocculent matter, somewhat resembling in appearance flakes of coagulated albumen; this water became turbid and foul in odor in twelve hours under Heisch's test, which was applied in many cases where time did not admit of more thorough examination; the well receives a considerable amount of pollution from the water used in washing and scrubbing. A sample of water from the well attached to the house first mentioned, which is occupied as a boarding house, gave little free ammonia, but .257 parts per million of albuminoid ammonia; this is probably rather worse than other wells in the vicinity; Heisch's test, however, showed putrescible matter in the water of all.

* We have learned since writing the above that the use of this water produces diarrheal and dysenteric symptoms, which are taken as proof positive of its medicinal properties!

East from this point is a locality similar in its surroundings to the second point of which mention has been made, and here also are noted eight cases of scarlatina, four of which proved fatal. No examination was made of the water of this neighborhood, but its general surroundings are such as to leave little room for doubt that the same conditions prevail here with the same disastrous consequences as were found in the neighborhood above referred to.

Turning again in a southwesterly direction, large mortality from scarlatina was found recorded in yet another vicinity, and here the wells probably derive their water from springs which flow out of the sand bluff east of the locality, spread over a boggy, undrained piece of land, and after having dissolved as much vegetable matter as possible, finally supply the wells close by. In one particular the last named two points resemble each other; in both cases the marshy ground affords pasturage for more or less cattle, whose excrements afford further contaminating material to the water.

A like condition prevails at a number of points near the southern limit of the city. Here all the wells are supplied with water similar in character to that of the two preceding localities, excepting only that few, if any, cattle find much pasture here. Water drawn from a well at one of these places gave .008 parts of free ammonia and .188 parts albuminoid ammonia per million, and this well was selected as being probably a fair representative of all in this locality. The water at several of these points is liable to contamination from a source spoken of in the first part of this paper, i. e., from matter derived from the decay of refuse lumber, a material which has been largely used in this place for the purpose of grading streets. Three cases of fever have occurred here, and others will probably occur as the locality becomes more thickly built up.

At a point east of the above a condition of affairs is found very much resembling that at the fourth point named above. Here, too, house, stable, privy and well are in close proximity to each other, and here too, disease has been rife.

Thus it will be seen that a remarkable connection exists between the condition of wells and other sources of water supply, and the presence or absence of disease of a certain character; wherever in

this city scarlet fever and diphtheria have been most frequent and fatal, the water used has been contaminated by foul matters oozing through the earth into the well from privy vault, or stable, or cesspool, or by the drainage from marshy ground.

As we said in the beginning, the interest and value of this inquiry are far from being local only; we have little doubt that the same method applied to the greater number of the cities of the state would develop a state of things startling enough to contemplate, and prove that the present comparatively low death-rate in Wisconsin is due to natural causes rather than to the care bestowed by our citizens on the condition of their surroundings. When we began the investigation we thought that it would be a useless task, and not until it was completed and we had the result in graphic form before our eyes, did we comprehend the full significance of the information we had obtained.

We believe, moreover, that if a similar examination of every town and considerable village throughout the state should be made, and the people induced to study with care the results obtained, the value of the life that would be saved would, in a single year, more than pay all the expenses connected with the survey.

This investigation shows as conclusively as anything of the kind can show, that an epidemic of scarlatina breaking out in a community is more unmanageable and fatal at those points where, other things being equal, the water supply is most liable to contamination. One fact seems specially worthy of note in this connection; one or two points were found in which few cases of scarlatina occurred, though the disease had raged all around them; several families here are supplied with water brought across the marshy ground near them by means of a small aqueduct constructed at their joint expense; this water comes from springs below the clay which underlies a sand bluff which stretches from north to south through the city; further comment here seems needless, since facts such as these speak for themselves. Again, in another vicinity are several families who also are supplied with water from pure springs close by; here, too, freedom from any serious disease was noted.

Outside of the city several instances of disease arising from foul

or contaminated water are to be noted. In one case, at a short distance to the west, a well had been bored into the sandstone rock for a considerable depth, and for a time furnished water of as good quality as could reasonably be desired. The family, however, after a while fell into a low state of health, for which no sufficient reason could be assigned; intestinal troubles and typhoidal symptoms made their appearance, and the attending physician long sought vainly for their cause; at last his attention was directed to the well, in the water from which he detected a disagreeable taste and odor, and, feeling certain that the ground of the trouble lay here, he insisted upon having an examination made. This was finally done, and resulted in the discovery of a large number of dead mice in all stages of putrefaction; upon the removal of these and the subsequent thorough cleansing of the well, all trouble disappeared and all the members of the family regained their usual health. The well, which up to that time had remained open, was properly covered over and there has been no further sickness, nor is any anticipated.

Here for the present our labor ends. It only remains to present in the following tables the results of the analyses which we have made, not only of wells and springs in the city in question, but of several rivers of the state, the waters of several of which are of better quality for drinking purposes than those usually considered sufficiently good. In making these analyses we kept in view mainly the determination of such constituents as affect injuriously the sanitary qualities of the waters examined, giving small attention to such mineral constituents as could have little effect in producing disease, but bestowing great care upon the determination of the products of decay of organic matter; in so doing we followed the example of the best sanitary chemists both in America and England.

Two separate analyses were made of the waters of the Wisconsin river; one at a low stage of the water during a long drought, the other when the water was sufficiently high to admit of log-driving and the running of lumber. Circumstances did not admit of our pursuing the same course with the waters of other streams, but

there is no reason to doubt that similar variations in the amount of organic impurities would have been indicated had this been done.

TABLE No. I.

ANALYSES *of water from six rivers of Wisconsin. Results in parts per million.*

	Free Ammonia.	Albuminoid Ammonia.	Chlorine.	Lime.	Magnesia.	Inorganic matter.	Organic and volatile matter.	Total solids.
Wolf river	.001	.092	.038	6.474	3.588	19.961	7.749	27.71
Fox river	..	.076	.033	8.026	5.689	26.612	6.058	32.67
Wisconsin (at low water)	.001	.072	.023	1.66	.....	15.929	6.051	21.98
Wisconsin (at high water)	....	.057	.014	1.00	.....	8.841	4.539	13.38
Yellow river	....	.175	....	1.37	.....	22.135	14.485	36.62
Black river	....	.237	.047	11.99	.....	23.95	18.59	42.54
Trempealeau river	....	.109	.059	4.329	3.068	21.078	9.142	30.22

The water of the grave-yard spring, table II, contained also nitric, nitrous and phosphoric acids; that of spring No. 6 contained nitrous acid. The tests were applied to the waters just as they came from the springs, i. e., without concentration.

The lime and magnesia contained in No. 7 were probably accidental impurities, neither being present in any marked proportion in the soil from which the water is probably derived or that through which it flows. The family using this water are suffering from diarrhœa, etc., but they "*are sure that the water can't have anything to do with it; there is iron in it.*" This last is a wholly mistaken impression, the water has a brownish tint and a disagreeable taste, but both are probably due to rotten wood.

The water from No. 4 is apparently unobjectionable in all respects, and is the only one concerning which this can be said.

Of the river waters, those from the Black and Yellow are probably unfit for drinking purposes, at least at low stages. The others present no specially objectionable features. We hope at some future day to examine these streams at higher stages of water and under different circumstances; how the same stream differs at dif-

ferent times may be understood by a very cursory examination of the reports of the Croton Water Board of New York; analyses are made of that water regularly once a week or oftener, but any one who, like ourselves, has used it for any long time, cannot have failed to observe remarkable variations in odor, taste, hardness, etc.; and the same thing is true of the supplies of Boston and other eastern cities.

TABLE No. II.

ANALYSES *of Water from Wells and Springs referred to in preceding pages. Results in parts per million.*

	Free Ammonia.	Albuminoid Ammonia.	Chlorine.	Lime.	Magnesia.	Inorganic matter.	Organic and volatile matter.	Total solids.
1. Well at house in which three fatal cases of scarlatina occurred	.....	.252	.21	.....	.....	5.58	24.766	30.346
2. Spring flowing from disused graveyard	.962	.484	5.53	12.43	4.665	53.652	28.544	82.196
3. Well at boarding house near which scarlatina and diphtheria prevailed	.159	.257	2.87	Trace.	.....	24.861	26.201	51.062
4. Spring supplying several families who enjoyed good health	.002	.068	.27	.062	.....	18.133	2.467	20.600
5. Well supplying family which suffered from diphtheria	.....	.198	4.63	.....	.....	23.916	10.360	34.276
6. Spring not used for drinking purposes, so far as known, by any family	.....	.330	2.14	.....	.....	34.176	19.361	53.537
7. Well exposed to contamination from decaying wood: *diarrheal disease now prevalent*	.....	.188	.39	4.27	3.02	22.045	12.027	34.072
8. Very foul well out of city	.897	.384	6.27	3.17	Trace.	41.376	23.645	65.021

Determinations of the gases present in the river waters were also made, but, except in the case of the Wisconsin, they are not deemed of value, not having been made from water freshly drawn from the river, and therefore not representing with any truth the

normal conditions. Water from the Wisconsin gave 6.89 cubic centimetres per litre of oxygen, 13.89 cubic centimetres of nitrogen, and 4.08 cubic centimetres carbonic acid, the temperature being 67° Fah., equivalent to 1.591, 3.208 and .942 cubic inches per gallon respectively. The water was taken from a point about fifty rods below a large rapid.

SCHOOL BUILDINGS.

BY PROF. THOS. W. CHITTENDEN, GRAND RAPIDS.

[In the following paper, while there is little that is claimed as original, nearly all that has been drawn from the many articles consulted during its preparation has been altered and amplified to suit the views and experience of the writer. It is offered by no means as an exhaustive discussion of the requirements of an ideal school building, but to call attention to the many defects existing in a fearfully large number of the school houses of the state, if not in all.

Material has been taken from articles published in the London Lancet, Pall Mall Gazette, Medical and Surgical Reporter, Medical Record, Sanitarian, Proceedings of American Social Science Association, and kindred sources of information.]

The system of public instruction in the state of Wisconsin is probably among the best in the United States, and bids fair to rival in time the best to be found in the civilized world. Its provisions are such that a child may begin by learning the alphabet in one of the many primary schools scattered over the state, pass thence through all the various intermediate departments, the grammar and high school, enter the State University, and finally graduate at the age of 20 or 21 prepared to enter on the business of life with all the advantages, neither few nor slight, which a course of study can afford which has been pursued under the supervision of the best instructors and has extended over a term of sixteen years or more.

Such at least is the theory and intention of the state, and the laws are carefully framed for the purpose of carrying these into practice. But too often in our zeal for the cultivation and development of the mind, we overlook the welfare of the instrument

through which alone the mind can manifest its culture and development. "Many children are taken from school suffering from headache, sore throat, feverish condition, weak eyes, etc., etc., caused, it is said and believed, by 'too close application to study,' when if the real cause were ascertained" it would be found to lie in the gross violation of all the laws which govern the healthy action of the body.

The laws of the state which regulate the examination of teachers, prescribe that all candidates for positions in our schools shall be competent to answer a certain percentage of questions upon various branches of knowledge, but among these the hygiene of the school room finds no place, and rarely is anything said or done in the course of an examination that has any tendency whatever to draw the attention of candidates to this most important of all the subjects connected with the teacher's work. In two cases only do we remember to have found any questions proposed during an examination which had a bearing upon the care of the health of the pupils. The questions referred to were: "What is the best means of ventilating a school room?" and "What is the hygiene of the external protecting organs?" And few of the candidates to whom these questions were proposed, had ever given a thought to either of the subjects to which they refer. We should rejoice to learn that we are in error upon this point, to have it proven conclusively that every examiner in the state has paid greater attention to questions of school and general hygiene than we have at present any reason to suppose, but we fear greatly that we are right, and that until school hygiene is made by law an important, yea, the most important subject of examination, the rising generation must continue to suffer.

"Work-houses, lunatic asylums, prisons, are all under competent medical supervision; school rooms, in which our children receive impressions, bodily and mental, which they will carry with them through the whole of their lives, these alone are left uncared for so far as the physician's inspection is concerned, and the slaughter of the innocents may there go on without awakening a single qualm of conscience on anybody's part."

School Buildings.

The following extract from a report of the Board of Health of the city of Boston, will apply to a greater extent of territory than is embraced within the limits of that good city: "Let some one who has never given a thought to the matter, enter some of our school rooms at about the middle of an afternoon session, on a damp winter day, where some sixty or seventy pupils are climbing the wearisome heights of knowledge, and the darkest troglodytic dwellings of our city have the scent of an orange grove in full blossom in comparison. Let him ask for the means of ventilation and his attention will be directed to two or three holes in the wall near the ceiling, but he will not be told whether moral suasion is to coax, or corporal punishment drive foul air through them," or supposing it to be withdrawn, what provision is made for introducing pure, warm air to take its place. There is a costly building, not far from the spot on which this article was written, in which a huge ventilating shaft stretches its length from the basement to the roof; registers and valves abound in all the rooms, and, to the eye of the casual visitor, great care seems to have been taken to remove foul and to introduce pure air. But *not a single room in the whole building has any connection whatever with the ventilating shaft*, and the whole costly and (in a double sense) imposing apparatus is practically useless for want of a proper furnace, and although such a furnace would at once heat the building at a far less cost of money, time and labor than that expended on the existing means, and insure proper ventilation through every room, the people of the district have decided not to provide one for an indefinite time! They taxed themselves cheerfully to a large amount to erect and furnish the building, but with singular inconsistency they decline to provide the means of introducing pure air for their children to breathe !

In order to take up our subject with some approach to system, let us consider what a school building and its surroundings should be, after doing which we shall be in a better position to determine how many of our existing school houses possess all the requisites of a perfect sanitary condition. Let us first look for a suitable

School Buildings.

SITE.

It should be elevated rather than low. Dampness of soil should condemn any site, however advantageous it may seem in other respects. The neighborhood of railroads, railroad stations and manufactories should be carefully avoided, as also should any proximity to hotels, "saloons" and places of similar character. The bank of a stream or a body of water is also an undesirable location. It is perhaps not too much to say that every school superintendent in Wisconsin can point to instances within his own jurisdiction in which one or more of the above named objectionable surroundings may be found. Here, the school house is placed in a low, damp spot, generously given to the district for the purpose, because its former owner could dispose of it in no other way, and found that the annual tax upon it amounted to more than the land was worth to him. There, we find the school planted upon a corner cut off from a farm by a railroad, or upon the bank of some large stream; again, a large and noisy manufactory stands directly opposite, with a hotel upon one side and a "saloon" on the other. Now, whatever inducement may be offered, whatever advantage may seem to accrue, a district board may be assured that the selection of any such situation for a school house will prove in the end the worst possible economy.

THE SCHOOL YARD

should contain an area of not less than forty square feet for each scholar; it should be so high that it can never be overflowed by the heaviest rains, enclosed by a substantial fence with proper cattle guards at the entrances, and should be thoroughly drained. Shade trees are desirable, but they should not be placed too close to the building.

A considerable difference of opinion exists as to whether a school yard should be paved or not;* in our own opinion, paved or planked walks should lead from the gates to the main entrances of the building, while the parts of the yard used for recreation should be left unpaved as a matter of safety; boys will play roughly,

* If paved, bricks should never be employed for the purpose.

wrestle, box, emulate the performers of the last circus, etc., and a fall upon unpaved ground is attended with less danger of sprains and broken bones than a fall upon stone pavements or even upon planks.

Separate yards should be provided for boys and girls, and a special enclosure for the use of the primary scholars is eminently desirable, especially where the intermissions for all grades occur at the same hour.

A CELLAR,

or at least an *air space of not less than two feet in clear height*, should extend under the whole building, and unless the soil be naturally very dry, a thorough system of drainage should underlie the air space or cellar, as the case may be.

THE BUILDING

itself should be so placed that the sun can shine into every room used for study or recitation, preferably during the morning hours, but at any rate at some time and for some hours of each day. This condition may in some cases involve the placing of a school building upon its site without regard to the strict parallelism of its lines with those of the street or road; an arrangement fulfilling the requirement may not be always practicable where land is costly, as in our larger cities, but in the great majority of cases it would be wholly so; so far as architectural considerations are concerned, it is certainly in the power of any competent architect to design any building, after proper inspection of its intended site, so as to produce no *outre* or disagreeable effect æsthetically, while yet it shall be properly placed with regard to the well-being of its occupants.

Stairs, passages, rooms for the storage of books, apparatus, etc., may be placed upon the shaded side of a building if a shaded side cannot be avoided, but hat and cloak closets should never be so situated.

Few if any school buildings should exeed two stories in height; for, let it be remembered, that *a definite amount of force is required to raise a given weight to a given height*, and that this is

true whatever may be the character of the weight; it makes no difference whether it be a stone raised by a steam-derrick or a human body raised by muscular force; the same law holds good. To require the exertion necessary to raise a weight of from fifty to seventy-five or one hundred pounds to a height of fifty or sixty feet, three or four times within six hours, is sheer barbarity in the case of any growing child, and is especially wrong in the case of girls just arriving at the age of puberty.*

ENTRIES

should be well warmed and ventilated, and should receive sufficient light from out of doors. Serious injury to health often arises from the fact that few entries and passages in our school buildings are warmed by any means whatever. In one of the most costly buildings in the state a peculiarly faulty state of things exists in this respect; a large hall extends through the building from east to west, from either end of which doors open directly into the outer air, no vestibules or other protection of any kind being provided; the school rooms are usually heated in winter to a temperature varying but little from 70°–75° Fah., while the temperature of the hall and other passages is never greatly above that of the external air, which is frequently below 0, reaching — 25° or even lower. Thus pupils in the school in question, who are of all ages from six to twenty years, and of all degrees of robustness, are compelled to pass from a well-warmed room into a passage in which the temperature is from 40° to 90° lower, without any previous preparation; we all know how exceedingly uncomfortable we feel when, as sometimes happens in this state, the mercury makes a descent of 40° within five or six hours; let us imagine the effect of a similar or even greater change occurring within five minutes without any adequate preparation therefor.

* A foot-pound is the amount of force required to raise one pound to the height of one foot; fifty foot-pounds may be either the amount of force required to raise one pound to the height of fifty feet, or fifty pounds to the height of one foot. Hence, to raise fifty pounds to the height of fifty feet requires an amount of force equal to two thousand five hundred foot-pounds, and this repeated four times requires the exertion of an amount of force equal to raising ten thousand pounds to the height of one foot, or *vice versa*.

School Buildings.

We are in little danger now-a-days of being allowed to forget that foul air is a poison, but we are in danger of forgetting that a blast of cold air is far more dangerous; we may breathe impure air for a comparatively long time and experience no immediate ill effects, but we cannot expose ourselves to the risk of being chilled by cold air, pure though it may be, without instant and serious danger; our instincts in such cases are safer guides than our reason. "*Foul air is a poison but it is a tolerably slow one, but a chill is as deadly as a dagger or a bullet.*" We who write these lines have personal knowledge of three separate cases in which young lives of great promise were sacrificed to gross ignorance or reckless defiance of that fact, and of several others in which the foundations of life-long disease and consequent suffering were laid by the same recklessness or deplorable lack of knowledge.

STAIRS

and the walls enclosing them should always be fire-proof; spiral staircases should never be permitted in any school building — a fact proved most conclusively by the fearful accident which occurred many years ago in the Greenwich Avenue school building in New York city; a perfectly straight stairway is to be preferred to any other form, and if stairways are over ten feet in height they should be broken up by a broad landing midway between bottom and top.

Stairs should be at least six feet in width in large school buildings, and never less than four feet in any case; the separate steps should never exceed seven inches in height, or be less than twelve inches wide in the treads. As has already been said, no school house should be more than two stories in height, but in the few instances in the state in which necessity compels the erection of a higher building substantial fire-escapes should be provided.

ROOMS FOR STUDY

must have a floor space of at least fifteen square feet per capita for primary scholars, and twenty square feet per capita for those over ten years of age; they must have a cubic capacity of at least 200

and 250 cubic feet per capita for the above named classes of pupils, and a clear height of not less than twelve feet.

Rooms for recitation which are not in constant use need have only three-fourths of the above amount of floor-surface, the height remaining the same.

All rooms, whether for study, recitation or general assembly, should have a window of at least eighteen inches in height over each door, fitted with such appliances as will enable it to be easily opened and closed by a person standing on the floor.

The walls of all rooms should be hard-finished, and if possible rendered non-absorbent; they should be tinted with some light neutral color; light bluish gray and sea-green are perhaps as desirable tints as any. Walls in a school building should never under any circumstances be papered.

No room used for study or recitation should be so large as to need columns or other supports for the ceiling; when these are necessary, as in chapels or other rooms for general assembly, they should be of iron and as small as is consistent with proper strength, that they may not interfere with the light.

Blackboards should be placed opposite the windows; never on the same side of the room. It has lately been recommended that they snould be purple-black or dark green in color.

WINDOWS

must contain a surface equal to thirty square inches of glass, *excluding sashwork*, for each square foot of floor space. Plain square sashes are better than those having arched or Gothic tops. The lower sills should be from three and one-half to four feet above the floor, and the upper within one foot or less of the ceiling. All windows should open directly into the outer air, and hung with weights.

SEATS AND DESKS

must vary in height to accommodate pupils of different sizes and ages. Except, perhaps, in the case of primary scholars, it is better to provide each individual with a separate seat than to try to economize space by seating two or more pupils at one desk.

School Buildings.

Seats should be low enough to allow their occupants to place both feet firmly and squarely on the floor when sitting erect, broad enough "to admit of the entire nates and five-sixths of the under surface of the thighs resting upon them," in the same position, hollowed out so that the weight of the body shall be properly distributed over the whole surface of the glutei muscles instead of being concentrated upon two points only, thus insuring the avoidance of painful pressure,* and always provided with backs, which should be properly curved so as to support the spine without causing any feeling of discomfort, weariness, or undue pressure at any point.

Desks should be so placed as to allow pupils to rest the whole fore-arm upon them without being compelled to lean forward unduly; special attention should be given to the distance between the desk and seat, and also to the height of the bottom of the desk from the floor. Many desks are so constructed as to give the largest possible space for the storage of books, etc., an advantage dearly purchased at the cost of hourly discomfort to the students who use them.

Some fifteen or more years ago we caused desks to be made for the use of two of our pupils, that were provided with a very simple arrangement by which a book could be supported in a nearly vertical position, thus enabling the student to sit in an easy erect position while reading or studying, while, when the desk was needed for writing, etc., the top presented a perfectly smooth surface, inclined at the proper angle. The arrangement was not suited to the requirements of a large school room, but certainly some of our ingenious manufacturers of school furniture ought to be able to design and make a desk in which the same purpose should be answered, without undue interference with a proper supervision of the school room, or any great increase in cost.†

* The suggestion has been made, with the view of relieving the pain and fatigue so often caused by the wretchedly planned seats generally used in our schools, and avoiding the confusion and disorder consequent thereon, that seats shall be made so high that a student shall neither stand or sit at his desk, thus being able to throw his weight upon his feet at pleasure.

† Since the above was written we have seen a circular issued by a Chicago firm, giving a representation of a desk in which the plan mentioned is carried out apparently in a very satisfactory manner. Vide also Report of this Board for 1877, p. 187.

School Buildings.

All seats and desks should be so placed that the pupils shall receive the light from above and on the left hand, rather than from any other direction. A direct front light should always be avoided as should also direct illumination of books, etc., by the sun.

THE ARRANGEMENT OF ROOMS

should be such as will enable the teacher to exercise due supervision without too great a strain upon the nervous system; in the large majority of cases this point receives little, if any, attention. In a room intended to accommodate forty-five pupils — and no larger number should ever be under the charge of any single teacher — having at least 900 square feet of floor surface devoted to the pupils, and an additional space of about fifty square feet for the teacher's dais, the figure of an exact square is the worst; a parallelogram measuring 26x37 feet is probably as good a form as any, and the teacher's platform should be placed on one of the longer sides, preferably on the same side with the windows, the blackboards being opposite. Nor do we deem it necessary for the pupils to sit facing the teacher's position; let their desks be so placed that the light shall fall upon them, as we have said, from above and the left hand, even though this should involve the absolute reversal of the usual arrangement of the school room, and seat the students with their backs toward the dais. And, let us say in passing, that this is by no means a new or untried plan: more than twenty years ago we were engaged in a large military academy on the banks of the Hudson river, New York, in which the peculiar arrangement of seats and desks above referred to was carried out and found to work admirably; we have never been engaged in a school room in which good order was more easily maintained.

All doors should be so hung as to open outwards, and should be of sufficient width to allow of two persons passing through them at the same time without crowding or inconvenience. Provision should also be made by which doors can be readily lifted from their hinges in case of need, thus leaving the doorway free from any possible obstruction.

SEPARATE WATER CLOSETS,

or privies, must be provided for pupils of either sex, and when they are placed out of doors they must be connected by means of covered ways with the main building, and properly screened; protection from the weather by covered ways is indispensable in closets for girls and young children of both sexes.

It is probable that there are few, if any, physicians in the state who cannot point to one or more cases of serious disease in females brought on by delaying as long as possible to obey the calls of nature, by reason of a natural reluctance to encounter the discomfort and exposure to cold attendant upon a visit to the privy as that building is usually constructed. As the health of our children, and especially of the mothers of future generations is concerned, it becomes an imperative duty to call attention to this fact. Not only should the privy and its approaches be well protected from the weather, but especial care must be taken to keep them dry, clean and well ventilated; if they are placed within the main building — and that situation has important advantages as well as serious drawbacks — they must be well lighted, warmed and ventilated by an outward current of air.

The best arrangement probably that can be made, especially in cities with a good water supply, is to build a special tower for the water closets, as is recommended by Mr. Eassie; such a tower should be at once connected with and shut off from the main building by a short passage provided with doors at both ends; both closets and passages in this case being furnished with ventilating shafts which must be carried up to the highest point of the building.

Privies should be sufficiently large, and those for boys' use must be provided with urinals of slate or other impervious material. Care must also be taken that all privies and water closets are so arranged as to afford no opportunity for the practice of solitary vices or any other form of licentiousness. Special accommodations should be made for the use of the youngest children. Under no circumstances should any closet be placed under any study or recitation room.

We have spoken at some length of the proper structure and keeping of water closets and privies, because we believe that it is very rare for any matter of such prime necessity to be so generally overlooked and neglected. Our experience of a quarter of a century as a teacher in schools of all grades and in many parts of the United States, has shown us that properly built and decently kept privies in connection with schools are rarely, if ever, to be found. They are often too filthy for any decent boy or girl to approach, and hence the important act of defecation is postponed, and health seriously if not irreparably injured. There is the most urgent need of a thorough reform in this respect.

VENTILATION

must be sufficient to furnish at least 500 cubic feet per hour of pure, warm air to every occupant of every room. For entries, passages, etc., from one-half to two-thirds of this amount is sufficient; for hat and cloak closets quite as much is needed as for recitation and study rooms, and in these, as in water closets, the current should be directly outward to the open air — never by any chance into an entry or, still worse, into an occupied room. Ventilation of cloak rooms, water closets, etc., by means of outer windows is not to be recommended, for the reason that snow and rain may easily enter by them; the use of a sufficiently large air-tube as above recommended is, perhaps, as free from objection as any other method.

HEATING

in a large building is best and most economically accomplished by one large central furnace, which ought also to be made a powerful auxiliary to proper ventilation. There is a singular diversity of opinion among those who have given most attention to the subject, as to where and how the warm air should be introduced into a room. The plan (proposed by Mr. L. W. Leeds) of warming the walls and floors seems among the best of those proposed, but we have no knowledge of its having been practically tested upon a large scale. The Ruttan system of warming and ventilating seems also to promise excellent results.

Heating by means of steam-coils or other radiators is among the most defective of methods, for the reason that heating only is thus

provided for, and the renewal of the air is wholly neglected. When furnaces are used the registers for the admission of warm air should be sufficiently large, as should also the shafts that supply them; the registers placed in the barracks of the British army are required to have an area of ten square inches for each person occupying a room, and the shafts which supply them an equal cross section; if shafts and registers be much smaller than this, the proper heating of the various apartments will require the rapid entrance of a current of air at a very high temperature instead of a gentle current, not warmer than 70° Fah.

The large majority of our school rooms, unfortunately, are heated by means of stoves, one of which is provided for every room in a building; thermometers are almost unknown, and the windows afford the only means of ventilation; these are opened and shut as the teacher, seated at her desk frequently close to the stove, happens to feel uncomfortably warm or cold. Cloak closets, where these are found, are seldom, if ever, provided with any proper means of warmth or ventilation, and the odor, too easily perceptible in them, of "old boots, dirty clothes and perspiration," is foul beyond description. In small buildings the heating apparatus may be a stove of sufficient size placed in a proper chamber in the cellar; there should be a shaft connecting this chamber with the outer air, and a register of sufficient size communicating with the school room above. Care being taken that the fresh-air trunk is kept open for the entrance of the air, and closed to rats or other vermin, a sufficiently warm temperature may be always secured with moderate attention.

If stoves are used in school rooms, no device in the shape of a "damper" should be allowed in the pipes, nor should any means whatever of lessening or obstructing the calibre of the pipes or chimney-flues be tolerated under any circumstances; the draught can be regulated by proper valves in the front of the stove.

HAT AND CLOAK ROOMS

should be attached to all school rooms, and be provided with proper pegs or hooks, placed at such heights from the floor as will enable those for whose use they are intended to reach them without un-

due effort. As has already been said, such closets should be properly lighted, warmed and ventilated, and some means should also be adopted by which damp or wet shoes and out-door wrappings can be properly dried in stormy weather: space for this purpose can generally be found in the basements of our larger school houses.

DRAINS

must be secured from injury by rats and other vermin by means of grated outlets, and proper care in the first construction. Special care must be had lest the water for drinking purposes becomes fouled by leakage from them.

WATER SUPPLY.

In cities furnished with a good system of water supply the pipes should be led into the building, care being taken to protect them from frost. In other localities water should be drawn from the purest accessible source. School authorities are usually too easily satisfied in this most important matter, with doing the thing that can be done with least trouble and expense. "Great vigilance should be maintained to see that, under no circumstances, does the wash from the privy or sink work into the well, as it may do when least suspected by indirect and hidden channels, or by surface drainage, with the result of producing typhoid or dysentery among the children of the school." In a case within our own knowledge the water used in a school in this state was drawn from a spring which flowed in close proximity to a privy in constant use, the distance between spring and privy being only about twenty-four feet; and we have observed other instances in which the school privy and the school pump were but little further apart.

Having thus briefly and imperfectly tried to sketch the main requirements of school buildings in regard to the health of their occupants, let us inquire how many there are in the state which come up to a proper standard in all, or even in the greater part, of the particulars of which we have spoken?

If the state, through its Board of Health, should appoint a competent inspector to examine and report upon the sanitary condition of our schools and their surroundings, a state of things

would be revealed disgraceful in the extreme to any civilized community.

We shall doubtless be told that to build school houses with all the improved surroundings and internal fittings which we consider necessary, would entail too great an expense on any but the most wealthy districts. We answer, in the first place, that the value of life and health in any community is not to be measured by dollars and cents; and, secondly, that *the cash value of the lives already sacrificed annually to unhealthy surroundings would more than repay any expenditure by which such sacrifice should be avoided.*

Sickness is costly; death still more so. "Simply as a productive machine a healthy child at any age is worth the money that has been expended on him for his support and development. The lowest estimate of the cost of supporting a child is $50.00 per annum on the average; hence a child of ten years old has actually had expended upon him the sum of $500.00, and if he die at that age he represents so much capital actually and irrecoverably lost to the community." *

There is urgent need of a better system of training our teachers; they should be able to recognize at once the signs of physical failure in their pupils, to take care of the body as well as train and develop the mind. But of the whole corps of teachers in this state what proportion are able to do so? How many can recognize an incipient spinal distortion or do anything to rectify it? How many know the normal distance of sight and hearing, and are able to apply the simple tests for the detection of defects in either? How many know even as much of near-sightedness, to say nothing of astigmatism and other more common defects, than is contained in the text-books of ten or a dozen years ago? And, when the teachers are found who know these things and can do them, how many districts are there who are willing to pay them a price commensurate with the value of their time and labor?

* Report of Massachusetts Board of Health for 1874.

INSPECTION OF PUBLIC BUILDINGS.

Gentlemen of the State Board of Health: — In the further prosecution of the work assigned to your committee on public buildings, the following report is submitted:

JAMES BINTLIFF,
Chairman of Committee.

PLATTEVILLE NORMAL SCHOOL.

The buildings erected for this institution are of stone, consisting of two parallel structures, one 40 by 60 feet, the other 40 by 70 feet, the two being connected by a building 41 by 56 feet, the whole, three stories in height above the basement. The basement is principally occupied by the furnaces, of which there are six, with sufficient capacity to meet all demands made upon them. The connecting building contains two halls, running at right angles with each other, through the centre of the building, with front and rear entrances providing a passage to each of the parallel buildings, and cloak and recitation rooms. In the west end of the south building, the primary department is located, in a room 24 by 28 by 15 feet in size, with seats for 40 pupils. This room contains 10,080 cubic feet of air space; and, including the teacher in the calculation, gives about 246 cubic feet of space to each person. This volume of space is not sufficient for the well-being of teacher and pupils. Providing ample ventilation is supplied, the best authorities name 300 cubic feet of space as the smallest allowance admissible for each person occupying a school room. The other departments of this institution allow space for each pupil as follows: Interme-

diate, 316 cubic feet; grammar, 300 cubic feet; normal, 260 cubic feet.

VENTILATION.

There are, in several of the rooms of this building, near the ceiling, openings through the outer walls, evidently designed to assist ventilation. These constitute a hindrance rather than a help. At best they afford outlets for the warm air which ascends directly from the registers to the ceiling; and, when certain conditions of the atmosphere prevail, become reversed and act as inlets for cold air.

The primary department of this institution is supplied with warm, pure air from a register 16 by 22 inches in size. Deducting one-third from its capacity for the obstruction caused by the scroll-work of the register, which is a low estimate, and assuming that the motion of the warm air current is at the rate of five feet per second, we have a supply of 716 cubic feet per hour for each person occupying the room. The ventilating flue is an independent one, constructed in the outer wall of the building. The inlet to this flue is at the floor, and is covered with a frame which divides the aperture in two parts, each part being covered with slats, similar to those used in window blinds. Each of these parts is in size 7½ by 11 inches. If we deduct one-fourth from the capacity of this flue for the obstruction caused by these slats, and assume that when in operation the motion of the air in the flue is at the rate of four feet per second, we find that it conducts from the room a volume of air equal to 605 cubic feet per hour for each person. With these appliances this room cannot be well ventilated for the following reasons:

1. The supply of warm air is insufficient. In consequence of the more rapid motion of all the vital organs, children need as large a volume of air as adults. The best authorities give 1,000 cubic feet per hour as the minimum amount necessary to maintain healthful life in each person confined in a room and engaged in intellectual labor.

2. Ventilating flues should have one-third more capacity than the flues for supplying warm air, because, in passing through a

room, the air loses considerable heat, and its motion becomes slower. The one in this room is smaller. Hence every moment the room is occupied, there is an accumulation of foul air.

A ventilating flue should never be constructed in the outer wall of a building, for the reason that, while it will always work less efficiently than if placed in an interior wall, where it would be warmer, at times it will not work at all, but will reverse its action, and introduce cold air instead of carrying off the foul.

The objections to the ventilation of this room, with the means now in use for that purpose, can be urged with equal or added force against every room in the building except the one occupied by Prof. Beck, and that of the Normal department. The ventilating shaft in the Normal department is heated, which makes its action more certain and rapid. But there are a number of rooms in which there is not even a pretense of ventilation. Notably the two recitation rooms in the grammar department, all those in the second story of the north building, and the whole of the third story. In the rear of the center of this building, and not to exceed fifty feet from its western walls, is located the privy used by the students of both sexes, several hundred in number. The entrances to this building from the two rear doors of the institution are separated by a high board fence. A pit, the whole size of the building, sunk to the rock, some twelve feet in depth, has been in use many years. With the prevailing winds in the west and southwest, as they are in this portion of the Mississippi Valley, we are sure that offensive odors from this vault must at times be carried to the several class rooms, whose windows open on the west side of the building.

Every school house in the land, especially those where our young men and our young women become qualified for the profession of teachers, should be a daily lecture, enforcing the truth that cleanliness in the air we breathe, as well as in the removal of the grosser forms of filth, is next to godliness.

THE STATE UNIVERSITY.

The people of Wisconsin are justly proud of their University. Its unrivalled location for healthfulness and beauty, overlooking

the Capital City, and the picturesque scenery of the valley of the Four Lakes; the fact that its support is now placed beyond the reach of petty influences, by a permanent endowment, which will grow with the development of our resources and the increase of our wealth; that its faculty is composed of men who have attained eminence in the world of science and of letters, who endeavor to make the University worthy to receive for higher cultivation the best fruits of our common school system; a center, from which through all time to come, shall flow among the people a knowledge of the traditions of learning and of the attainments of the human mind in every department of investigation and of thought; these salient characteristics of our chief educational institution, challenge the admiration and gratify the ambition of every citizen of the state.

Although a matter of deep regret, it is not surprising, that the larger portion of the University buildings are not as well adapted to promote the physical well-being of the students who daily congregate within them, as the other means of the institution are to advance the development of their mental powers; for it is probably true that, prior to 1870, there had not been erected in all of the northwestern states, one public building supplied with adequate means of ventilation in every part. There are evidences of attempts to do something in this direction in all of them; but in every case yet brought under our observation, the means provided for this purpose, prior to that date, betray a singular lack of knowledge of the simplest principles of ventilation, and, of course, never accomplished the object for which they were devised. This is true of

UNIVERSITY HALL,

a noble building erected on the summit of the University grounds. In the interior and the exterior walls of this structure are built a number of flues designed for ventilation; but all attempts to make them operative have long since been abandoned. The reasons for their uselessness are apparent: 1st. There was no means provided for heating them. 2d. A large number, if not all, open into the space between the ceiling of the upper story and roof, from which there is no outlet into space.

This building is principally occupied with rooms for members of the faculty and for recitations. During the portion of the day when the recitation rooms are continuously occupied, they must become very offensive for lack of pure air. Architects have a much better knowledge of the subject than they had, even a decade ago; and by placing furnaces in the basement, which is now unoccupied, any competent architect could construct an efficient system of works for warming and ventilating this building, at a merely nominal cost, when compared with the advantages to be derived from it, and without interfering with any of the present interior arrangements.

THE DORMITORIES.

We are told that other universities do not now furnish dormitory buildings for students, and that the practice will probably soon be abandoned here. To us the better probability seems to be that, long after the present generation has passed away, these buildings will be demanded for their present use by a class of young men who cannot afford to hire board and rooms in the capital city; and that it would be a wise policy to make them healthful and desirable for this class of students.

The two dormitory buildings are each more than one hundred feet in length, three stories in height above the basement; each story, about 12 feet in the clear, is subdivided into four tiers of rooms, two suits in each tier. Each suit is composed of one sitting or study room, and two bed rooms; and is occupied by two, three or four students as circumstances may require. In these rooms the students probably spend more than two-thirds of their time; and no attempt has ever been made to ventilate them. They have not been whitewashed for years. Within twelve feet of the south building is a privy which, in more than one sense, is an offense.

Efficient apparatus for warming and ventilating these buildings, with two furnaces in the basement of each, ought to be constructed and maintained. If such apparatus should be built and the care of it committed to the students, requiring them to keep a record of the temperature in each story of the building, at the end of each hour during the day, note with an anemometer the motion of the

currents, and the variations, if any, and the cause, in different parts of the building, and make a record thereof, also of the aggregate volume of air passing through the building each hour; and, if the record so kept should be made the subject of inquiry and discussion at stated periods, by a member of the faculty, with these students, they would thus acquire a practical knowledge of the principles governing ventilation.

By the adoption of more cleanly habits and more comfortable modes of living among all classes, modern society has put an end to the periodical plagues and devastating epidemics which for centuries swept over Europe with such terrible results; but, living in tight dwellings, without an adequate supply of pure air, has brought to us a long list of diseases. Science, however, has shown us how these diseases may be avoided; and there no longer exists any excuse for our higher institutions of learning continuing one of the practices which has been most influential in bringing these diseases upon us, and thereby aiding in perpetuating them.

LADIES' HALL.

The erection of this building, a few years ago, marked the full establishment in the University of the coëducation of the sexes. It was the intention of the regents that Ladies' Hall should be supplied with all the latest improvements, and made convenient in its adaptations, pleasant and healthful. Capacious in its proportions and elegant in its appointments, with broad piazzas on the south side of the building, extending the whole length of the wing, where, in unpleasant weather, the students can take exercise, it is in many respects an admirable structure. But in regard to ventilation, while a step in advance of the older buildings, it falls far short of what such a building should be in important respects.

The outline consists of a front, a little more than 50 feet square, with an extension to the rear 40 by 90 feet in size; the whole being three stories in height above the basement. Generally the space enclosed by the front part of the building is devoted to the executive department of the institution; the extension is occupied by the students.

There is an excellent system of ventilation provided for the rooms in the front part; none for those in the extension. That is, those rooms where the students spend much the smallest part of their time, are ventilated; those where they study and sleep, are not. Nor is there any ventilation supplied to the long halls which run through the center of the extension, connecting the students' rooms with those in the front part of the building. They are heated by warm air from one of the furnaces in the basement; but there is no means provided for disposing of the foul air which necessarily flows into them from the rooms on both sides whenever the doors are opened. That ventilation appliances should be placed in a building devoted to educational purposes, while the rooms occupied by the students during the periods given to relaxation, study and sleep are excluded from participation in the advantages so necessary to the preservation of health, denotes an unaccountable confusion of ideas on the subject. This defect should be remedied. Physical well-being, which is the true basis of intellectual growth, cannot be maintained in an impure atmosphere. Besides this, parents are beginning to inquire how much an education is worth, obtained at the expense of having their sons and daughters confined in unventilated rooms for a large portion of their time for years, dwarfing their powers or undermining their constitutions at a period when they should be developing into vigorous manhood and womanhood.

SCIENCE HALL

is one of the most imposing and admirably constructed buildings, for the purposes to which it is devoted, on the continent. It has a frontage of 174 feet, and is about 60 feet in depth, with two wings to the rear, of 127 feet each in length, leaving an open court between the wings. The building is four stories in height; the stories being respectively, 13 feet, 14 feet, 15 feet, and 18 feet high in the clear. A steam engine furnishes the power with which to run machinery needed for experimental and practical work; and the boilers are large enough to furnish steam for the engine and for warming the building. The museums are sufficiently capacious to become a vast store-house of specimens illustrative of the facts of

science, and already contain admirable collections. The lecture rooms are models of convenience; and the laboratories of the several departments are supplied with all the conveniences and apparatus which a wise and liberal policy could obtain. We need not give a further description of this grand edifice, which, with its varied appliances to aid in imparting instruction, is, to the student, a constant incentive to inquiry. The economy practiced in erecting this building was, in some respects, carried too far. Among others, in providing ventilation. Two ventilating shafts were erected for the pupose of carrying off the impure air. These are located near the junction of the wings with the main building. The shaft on the south side of the building performs its office successfully; the north shaft does not. Where registers are placed in the wall of this shaft good ventilation is obtained; but in rooms at some distance, connected with the shaft by a horizontal duct, there is practically no ventilation. Some of these rooms are recitation rooms which, during the time they are occupied, become very offensive from the accumulation of foul air. The difficulty is probably three-fold. 1. There are too many openings in the wall of the shaft. 2. The ducts are not air-tight. 3. It is very doubtful if, in a building of this size, the principle of providing each room with an opening into the ventilating shaft is a correct one. Rooms at a distance from the shaft cannot be ventilated in this way. Any competent architect, however, can easily, and at a small expense, provide a remedy for this lack of efficiency. A supply of pure air, and, in other respects, cleanly and healthful conditions, are among the first requirements of an intelligent existence; and to the authorities to whom are committed the education of our children, do Boards of Health look with more solicitude than to all other influences combined, to teach a knowledge of these principles.

EXTRACTS FROM

SPECIAL CORRESPONDENCE.

NOTE. — From the many letters received at this office, chiefly in answer to the circular asking information in regard to the sanitary condition of the state, embodied in the report of the secretary, we make the following extracts, which contain information of so much general interest as to render their publication desirable. The correspondence referred to shows a great increase of interest in the work of the board on the part of the writers, and, moreover, exhibits with much clearness the causes of a large amount of preventable disease.

As was the case last year, our limits compel us to condense into the smallest compass all that we print, and also to omit much material of value. The extracts here given, however, fully illustrate, as we believe, the spirit of the whole correspondence; and while our thanks are due to all the gentlemen who have favored us with the contributions from which the following excerpts have been taken, we are under equal obligations, no less sincerely acknowledged, to many others, from whose communications no extracts are here presented. Many of these last have been of a character such, that while they offer no material of sufficient general public interest to require publication, they have yet been of great service to the board in the prosecution of its special work.

From making extracts from still another class of letters, we have been restrained by the wishes of their writers.

For convenience of reference, the extracts that follow have been arranged in alphabetical order according to the towns, etc., from which they have been received.

Secretary of State Board of Health.

Extracts from Special Correspondence.

Dr. Guernsey, of *Almond*, writes as follows: "We have had no epidemic during the year; pulmonary diseases have been prevalent, owing, I think, to a greater amount of rain than usual, together with dysentery, cholera morbus, typhoid fever and a few cases of diphtheria.

"Last September I was called to see a young man who was suffering from a malignant attack of typhoid, which I think was caused by using water which received the drainage from a barn yard near by. All the members of the family and several of the attendants also suffered in the same way."

From Dr. Eichenmiller, of *Auburn*, we have the following: "Parotiditis or mumps was prevalent through this section during June, July and August last, to an extent hitherto unparalleled in the history of the town, both in point of number and in the severity of the disease; nearly every family had one or more members attacked. A peculiarity of the disorder was the fact that at least 90 per cent. of all who were attacked had either enlargement of the testes on one or both sides, or painful enlargement of the inguinal glands, with symptoms denoting a similar condition of the lymphatics. The course of the disease was about two weeks."

From *Baldwin*, Dr. S. E. Farnsworth writes as follows: "The principal source of danger to health here is in the low grounds, shallow wells with privies near by; privy vaults, in my opinion, should never be allowed, as in time they must of necessity affect the water used for drinking and culinary purposes. This village has been in a very filthy condition ever since its organization."

From *Baraboo* we have the following from Dr. M. M. Davis: "During the winter and spring, pulmonary and bronchial affections were somewhat prevalent; the type of pneumonia was severe, many times typhoid in character, giving us a larger rate of mortality than had been known before in many years. Diphtheria has appeared sporadically, but the mortality has been large; so far as I know, all cases of diphtheritic croup have terminated fatally.

"In one locality in this village, there were five cases of typhoid fever, three proving fatal. The water used here was from a well

that was surrounded by many out-buildings, including a barn and a privy. As soon as the use of this water was discontinued, typhoid fever disappeared."

From *Bell Centre*, Dr. R. E. Glover writes to the following effect: "We have had much more sickness than usual; the excess over other years has been caused by miasma, hence agues and remittent fevers have been rife. We have had also several cases of sore throat of a malignant type, fatal cases ending in from two to fourteen days; the fauces were covered with ulcers, devoid of the diphtheritic membrane; the mouth was filled with frothy saliva; when the larynx became affected, the disorder ended fatally.

"Agues can in great measure be prevented by making *cut-offs* in the river, thus straightening it and lowering its bed, whereby sloughs would be made dry and capable of cultivation."

We have from *Beloit*, from the pen of Dr. S. Bell, the report "that there has been much less sickness than for a number of years past, none indeed, thus far, of a severe type. During the three months just ended we have had very much intermittent fever, mostly quotidian in type, all the cases in the city occurring within a radius of one-half mile from the mill pond, and nearly all along the river. Aside from this we have had but little sickness, as compared with the last four or five years."

From *Benton*, Dr. H. T. Godfrey sends the following: "There has been a much larger amount of malarial disease than usual in this vicinity, remittent and intermittent, with a few case of spinal meningitis, typhoid fever and mumps. I think many of our diseases are preventable by proper ventilation, care of water supply, etc., but prevention is hardly within the reach of individuals. Among the most fruitful causes of disease here I should number imperfect ventilation of dwellings, pollution of water supply from cess-pools and cattle yards, bad cooking, and badly constructed school houses. There has been a disease which I believe to be typhoid pneumonia prevalent amongst hogs in this section of the country during the past season, many farmers losing their whole herds. Would it be practicable for the Board of Health to appoint

a competent veterinarian to investigate the diseases of domestic animals and their bearing on human health?"

We have recently received a second valued communication from Dr. Godfrey concerning this disorder, from which we make the following quotations, as the subject is one of great importance to the people:

"The disease has been prevalent here for some months past; it usually commences by loss of appetite and dullness, the animal lying in one place all day; then diarrhœa sets in, with extreme thirst and difficulty of breathing, which latter symptom gradually increases till the death of the animal, which sometimes takes place in a day or two, and sometimes not for three weeks. In many cases the animals, after a couple of weeks' illness, are attacked with ulcers on the extremities and head, which show no disposition to heal. The breath is very offensive, having an almost gangrenous odor.

"I believe the disease to be highly contagious, as it travels from farm to farm in regular succession, and does not seem to originate in any herd without intercourse with some other. I do not think it is communicable to other domestic animals, as I have seen or heard of no similar disorder in any other stock. I saw yesterday a large lot of infected hogs running freely amongst sheep, horned cattle and horses, the latter animals all in perfect health. * * * * * I will say further that not five per cent. of the animals attacked recover, and none of them ever do well enough to be marketable.

"It seems to me that the point which interests us most as sanitarians, is that farmers with large herds, finding the disease amongst their hogs, will immediately rush the whole of them into market, thus, no doubt, selling to be used as food many animals laboring under the disease in its incubative stage. If men who slaughter hogs were obliged to keep them a week before killing them, and not allowed to kill any animal without previous inspection, it would, I think, secure the public in that respect.

"The disease has raged for some months in Grant, Iowa and Lafayette counties, Wis.; Jo Davies county, Ill., and Dubuque county, Iowa."

Extracts from Special Correspondence.

Dr. H. B. Cole, of *Black River Falls*, says: "About all the sickness here the past season has been among children, and has been of the usual summer type. In the northwestern part of the county there has been considerable diphtheria among the Norwegians; cases occurring in damp, low places, and in badly built houses, have been very fatal, all the children dying in four or five days. These people live in remote corners and will not employ a physician or follow directions that may be given; cases are frequently reported in which the body of one child has been kept in the house until several others have died. In many cases the subjects are taken with a chill, become comatose and never rally, dying in from 24 to 48 hours."

From *Bloomer* Dr. J. I. Hamilton writes as follows: "There have been more fevers than usual in this locality during the past year, of typhoid and bilious types; diphtheria and diphtheritic sore throat have also been prevalent to some extent. Some atmospheric poison, perhaps arising from the bad condition of our streams and water-courses, seems to me to have been the cause of most of the sickness hereabouts. There is a mill-dam in the town and one two miles above. In very dry weather the water above these dams becomes stagnant and is covered with a confervoid growth to such an extent that the bottom cannot be seen through a depth of two inches of water; such a condition of things cannot be very favorable to the health of those living in the neighborhood. If the gates to these dams could be raised once a week and thus wash out the water-course, a great deal of sickness might be prevented. As health officer of the local board of health, I issued a circular asking our citizens to clean up their door-yards and cellars, take proper care of their privies,* etc., the effect of which I think was good; many acted in the matter, but others could see no necessity for doing anything more than they had always done."

Boscobel, through its health officer, Dr. G. Cameron, sends this:

*If the health officers of local boards of health would more generally imitate this good example of Dr. Hamilton, and follow their circulars by enforcement of obedience to sanitary laws in cases where there may be special need for so doing, the beneficial results of such action would be speedily apparent. SECRETARY.

Extracts from Special Correspondence.

"The inhabitants of this city have suffered but lightly from zymotic diseases. Scarlet fever is the only one that has retained its footing for the past two years; fortunately it has been of a mild type, so mild as to almost obliterate the dread usually felt from its presence. During the fall months the inhabitants along the Wisconsin river suffered to an unusual degree from intermittent fevers, but within the city limits very few cases occurred, and the sanitary condition will compare favorably with that of any former year."

It is said that the death-rate of the city of Boscobel stands at the unusually low figure of only 9 per thousand for the year 1878. It would be interesting to know what part of this exceedingly favorable showing is due to natural causes and surroundings, and what share compliance with sanitary laws has had in producing so excellent a result.

G. Mellberg, of *Bussyville*, contributes the following: "The location of this village is only about five or six feet above Koskoning Creek at low water; when the water is high the cellars under the houses fill with water, and last summer being very wet, every cellar was a pool of stagnant water, and some cases of congestive chills occurred. What can the (local) board of health do? I think that all these cellars might be drained by ditches and pipes, but I find that some of the owners prefer the expense of chills and fever to that of drainage."

From *Douglas* we receive the following from Dr. H. H. Parrott: "In answer to your inquiries I would state that during the past year the diseases most prevalent have been fever and diarrhœa, the same complaints that have been most frequent for years past. There are extensive marshes in the neighborhood and they remain undrained which I presume to be in a great measure the causes of the above diseases. The owners of the lands are, with a few exceptions, pecuniarily unable to get them drained, as they are numerous and large, and their drainage would require a combination of many persons to accomplish it. The above mentioned complaints have, however, been less troublesome of late than at any time during ten or fifteen years past; I attribute this in part, at least, to partial

drainage of some of these marshes by individual owners who have attempted to improve their water-soaked lands."

Dr. J. J. Leavitt writes from *Fennimore:* "There has not been as much sickness on the whole as in some former years. We had influenza during the early fall with bronchitis; later came some pneumonia and diphtheria of rather mild type, none proving fatal, and some bilious and typhoid fever. Many of the diseases, such as diphtheria and scarlet fever, could have been prevented by thorough disinfection, or even by white-washing old and dirty houses, which I had done in several instances, and thereby, I believe, saved several lives. I find these sanitary measures very much neglected, especially among our foreign population. During August and September I had quite a number of cases of bilious fever, all occurring in young men who had been in the habit, during harvest and haying, of going in swimming while heated. I do not recall a single instance of the disease that did not occur among those who bathed in cold spring water while heated. No deaths occurred from this cause.

"We have one nuisance in our village, namely, a slaughter house, where from six to ten beef cattle are slaughtered each week. There are not less than from seventy-five to one hundred persons living, eating and sleeping within twenty rods of this place! The attention of our town board has been repeatedly called to it, but they have thus far neglected to take any notice of it. I may add that all the blood is allowed to soak into the ground, and much of the offal is permitted to lie and decay in the hot sun around the building. In the same block is a well which supplies water to all living on the block and several families outside; at no very distant day in the future we shall reap the ripened fruit of this nuisance in the shape of some malignant disease." *

Genesee Station reports briefly as follows through Dr. C. C. Har-

*It is almost certain that there are many localities in the state where a condition of things exists equally bad with that described in the above communication. The consequences cannot fail to be disastrous in the extreme to all who use water so contaminated. Local boards of health have the fullest powers under the present statutes and also under the common law to deal with all such cases, and should proceed promptly and without fear or favor, inasmuch as life and health are the most valuable of all temporal possessions.—SECRETARY.

ris: "During the last year there has been less sickness of all kinds than during any one of the ten preceding years which I have been here. I have treated more cases of pneumonia than of any other one disease."

From *Geneva*, Dr. G. E. Catlin writes: "Within my observation extending over an area of about eight miles' radius around this village, the amount of sickness has been less than last year. During the autumn and winter months the type of fevers in this vicinity was quite generally typhoid; i. e., there were more cases of typho-malarial and enteric fevers than I have seen for eight years. There were fewer cases of pneumonia and diphtheria hereabouts than last year, but the few cases were of a very malignant type. No epidemic of any kind. I think the worst cases of diphtheria and typhoid could have been prevented by proper attention to cleanliness about the dwellings and wells. In October, 1877, nine cases of malignant diphtheria in one family could be traced to nothing but filth inside and out of the dwelling, and cess-pools around the house; the well contained much decaying animal matter. At this time there was no epidemic of diphtheria, but afterward eight cases of malignant type occurred traceable to contagion from the above. Five cases of typhoid fever that I treated were clearly traceable to bad well water, decayed animals being found here also in the well; four of these recovered and one died.

From *Kilbourn*, we have the following from Dr. G. W. Jenkins: "The inhabitants of this city are paying more attention to keeping streets and alleys clean. Cisterns are more frequently cleaned out, and more water is filtered for both culinary and drinking purposes. I am quite satisfied that some of the sickness might have been prevented by the timely removal of manure, decaying vegetable matter, etc., and the filling up of cess-pools in the back alleys and streets of our village. The principal sources of danger to health, here, are impure water for drinking purposes, and filthy alleys. Within the past year, more attention has been paid to procuring pure water for drinking purposes by sinking wells into the sand rock, drilling into it by horse-power until a sufficient supply

of water is obtained, which is usually done at a depth ranging from 80 to 110 feet. From the rock up to the surface the well is thoroughly cemented, leaving a bore of the same diameter as that in the rock, thus effectually cutting off all surface drainage. The water, which is usually brought to the surface by means of a windmill, is nearly or quite as soft and as pure as can be obtained from the earth.

"In the farming sections, more attention is paid to the location of wells; barn yards are more frequently cleaned out, and greater attention is paid to the well-being of the members of the household than was paid even so lately as a year and a half ago."

From *Lincoln*, Mr. F. Gregor sends this report: "I have no means of finding out how many cases of sickness have occurred in this town, but I know there have been many of diphtheria, whooping-cough, measles, and some few of typhoid fever. Our people generally doctor themselves, and it is almost impossible to find out what diseases really exist among them. One thing which deserves mention [and reprobation — SEC'Y] is the way in which people take care of their wells; they generally have a hole by the well filled with water in which the hogs are allowed to wallow at all times. No wonder they get sick!"

From *Mauston*, Dr. J. E. MacNeill writes thus: "Your circular desiring information regarding the health and sanitary conditions of this locality was duly received. I am hardly prepared to give you much information of value. There has been little disease prevailing here, except malarial trouble, of which there has been considerable, especially at Lemonweir, three miles from here, where it is rather low and little or no attention is paid to drainage."

From *Milford*, Dr. J. J. Bennett sends the following full and interesting information: "The amount of sickness in this locality for the year ending September 1, 1878, has been much less than for the corresponding period in 1877. The diseases which have been most prevalent are measles, whooping-cough, bronchitis, diarrhœa, dysentery, intermittent and remittent fevers. So far as I am able to judge, none of these diseases could have been prevented by at-

tention to sanitary means, for this section of the country is well supplied with good water; barns, privies, etc., are nearly all at a good distance from dwellings and water supplies, and the great majority of dwelling houses are comfortable and susceptible of being well warmed and properly ventilated. The best method of preventing disease in this locality is, probably, to teach the people hygiene — a thing that the masses everywhere are too indolent and self-conceited to learn.

"In February, 1877, two families in this village occupied rooms in the same house; a young man, a member of one of these families, had scarlet fever, and was put into an upper chamber, every precaution being used to prevent the spread of the contagion; only a brother belonging to the same family contracted the disorder, and both patients recovered. The sick-rooms were thoroughly disinfected and cleansed, and all clothing, etc., baked, boiled and otherwise treated, except a box which stood in a room separated by a loose board partition from the sick-room, and containing some woolen dresses belonging to the other family. Two months later this second family removed to another house taking the box with them; somewhere about January 15, 1878, the mother ripped up one of the dresses from the box and made from it a frock for her six-year-old daughter, fitted it upon the child on her return from school, and afterward hung it away in a closet. On the 21st or 22d of the same month this child was seized with scarlatina anginosa, from which she recovered in about 14 days. The usual exertions were made to prevent the disease from spreading, and I have no knowledge of any other case occurring within ten miles around. Now, did the child contract scarlet fever from that infected dress? Remember that it was only fitted upon her, not worn, but put away and not brought out until after her recovery, when it was properly disinfected and worn in the company of other children without any evil results. My theory is, that the disease-germ (whatever that may be) found its way through the cracks in the partition, became entangled in the loose woolen material, and passed into the circulation through the respiratory passages while the dress was being fitted upon her. The box was uncovered during the whole of the

time that the sick persons occupied the adjoining room, but no member of the well family entered the apartments of the other until several days after all danger of infection was reasonably supposed to be over."

From *Neenah*, Dr. J. R. Barnett writes: "There has been no prevailing disease in this vicinity during the past year. It is a little hard to account for the unusual health of the community during a season somewhat remarkable for the length and intensity of its heated term, and especially for the comparative exemption of children from diseases characteristic of the period.

"It is very probable that one cause operating in all localities in the state can be counted as of some importance in producing this state of things — the more temperate and wholesome modes of living necessitated by the hard times. Here the people have been spared the extreme of want, with its necessary attendants, feeling only the restraint in living which is obviously for the public good."

From *New Richmond* we have the following from Dr. O. N. Murdock: "I think my report for this section quite encouraging. Pertussis is the only disease that has prevailed epidemically in this section during the past year, and that only to a limited extent, no case proving fatal. There was an unusual amount of cholera morbus during the latter part of July and first of August, or during harvest, caused undoubtedly by the combined effects of extreme heat, over-exertion, and undue indulgence in eating and drinking, especially the latter. I neither saw nor heard of any fatal cases. There has not been the usual amount of what I term accidental disease — such for instance as pneumonia, pleuritis, bronchitis, etc., traceable to exposure and careless habits.

"During the month of December I attended four cases of typhoid fever in a single family, the pneumonic and typhoidal symptoms appearing so simultaneously that it was difficult to determine which was the original disease and which the complication. I found the family had neither spring nor well as a water supply, but procured their drinking water from a lake a mile distant. The water appeared quite pure, the lake having an outlet and no bogs or swails

connected with it. Four barrels of water were drawn at a time, and the family were obliged to store it in the kitchen until used, on account of the freezing weather; that amount was sufficient to last about two weeks. It soon became warm and distasteful, and was in every sense of the word stagnant and very unwholesome. The mother called my attention to the two younger children, one of whom had an inflamed sub-maxillary gland, and the other an enlarged lymphatic gland in the groin. Noting the scrofulous diathesis and the character of the water, I regarded the disease as typhoid fever, and the pneumonia as the complication. All the cases ended in recovery.

"Since my last, we have succeeded in getting the village incorporated, and the health officers, of whom I am one, have made many sanitary improvements, such as cleaning out foul alleys and privies, enforcing the thorough drainage of cess-pools, and their removal, in some cases, in which they were in undue proximity to wells."

From *Oconto*, we have the following from Dr. D. P. Moriarty: "The main cause of disease here is the use of water from the river, the banks of which are covered with out-houses. The majority of diseases in the past have been preventable; drainage is the best method. All traceable diseases may be attributable to general unsanitary conditions — cause, no local board of health, and no sanitary measures. All improvements seem to benefit the public health."

From *Oshkosh*, Dr. G. M. Steele writes as follows: "For the past year we have had little sickness, and nothing of any special interest. Most prevalent have been phthisis, diphtheria, pertussis, lung and throat troubles, measles, scarlatina and mumps. None have been very prevalent until this fall, when we have had quite an epidemic of diphtheria; we have also had a greater prevalence of fall fevers than at any time during the last three or four years. Diphtheria has claimed a number of victims in our city and the surrounding country. In a large majority of cases that have come under my observation, I have found local filth contamination; and generally in proportion to the amount of filth is the disease more or less malignant. The worst type of it that I have seen was in a family where

the living-room had water and rotten, mouldy timber under it, and there was no ventilation, and absolutely nothing inside the house that was clean. The parents and four children inhabited this tenement, and all the children had the disorder in a malignant form; two were buried together, and a third died within a month of acute phthisis, supervening on diphtheria. The fourth made a good recovery. The family was poor and their living not generous.

"At another house, three out of five children had the disease; the other two were very young; two of these cases were quite severe, though none died. Here the household slops were thrown about the back yard; this being very small, much poison emanating from the ground was mingled with the air breathed by all in the house; to make matters still worse, in front of the dwelling was a sink hole left in repairing the street, into which emptied a neighbor's slop drain. The stench from this cess-pool was at times so great that the neighbors could hardly stand it, yet it has not been attended to by any one! At still another house occurred one death out of three cases. Here the cellar drain connected with the slop drain of a neighbor, and the living room thus was infected with foul gas; this room was directly over the cellar, between which and it was an ill-fitting trap door.

"In a butcher's family living over the shop, five cases occurred, some very malignant, and one ending fatally. These premises were kept very clean, and possibly the disease was taken during a visit to a relative's family, where a malignant case died. It is not always possible to detect local causes, but in the large majority of severe cases these were not wanting. I am freely convinced that the sanitary conditions of our city might be so improved that diphtheria and its allied affections would be materially lessened and their virulence greatly modified."

From *Oxford*, Dr. A. G. Stoddard writes thus: "There have been some changes in the relative proportions of different diseases during the past year. Our annual run of typhoid began later and is having a milder course than usual. Many babies have died of stomach and bowel troubles during dentition. We have had no small-pox, scarlet fever, measles, whooping-cough, etc., but did have

a few cases of diphtheria during the month of March, which were very malignant. Last winter did not give us many cases of acute pneumonia, but catarrhal troubles predominated and many old people suffered from senile bronchitis. Our more malignant cases of typhoid may almost if not quite invariably be traced directly to some local cause. I believe one, if not the chief cause, to be the very general ignorance that prevails in regard to the simplest hygienic rules. Poverty also seems to be a great breeder of zymotic diseases. For example, an Irish family in my neighborhood all took fever almost simultaneously; I found the cellar filled with vegetables stored for winter use, and no ventilation except through large crevices in the floor which separated it from the room in which the family lived; everything had a filthy and poverty-stricken appearance."

Pechtigo sends the following through Dr. L. J. Smith: "We have had no serious visitation of disease; there were a few cases of small-pox in one of the lumber camps last winter (1877–8), but the disease did not spread and there was no fatality. There was also some diphtheria last fall, but only one death so far as I know; the disorder visited seven families widely separated from each other; two of these were in the village and the sanitary conditions were bad; the want of cleanliness and ventilation were marked in both; nearly every member of both families, which were large, became the subject of the disease.

"The surface drainage of this village is bad; the ground on which it stands is low and surrounded by swamps which in some places invade the village itself. The soil is altogether sand with some vegetable humus intermixed and is about ten feet in depth, being underlaid by lime-stone; water from the surface readily filters through to the river level. The water supply is derived almost wholly from wells in this drift, their average depth being some ten feet. After rains the taste of the water is very perceptibly modified. In the spring and winter of 1877 we had one of the most terrible epidemics of scarlet fever on record."

Mr. R. J. Gilbert writes from *Plymouth* as follows: "The

most noticeable cause of sickness in this locality is traced to a mill-race in the village of Hanover. When the mill runs so constantly as to draw all the water out of the race and pond, the malaria that rises therefrom during hot weather is almost suffocating. During the year 1877 much typhoid fever occurred from this source; every family along the line of the race and those within range of the prevailing winds therefrom was effected, not one escaping."

From *Racine*, we have the following communication from Prof. R. C. Hindley: "One element of danger, especially in places like this where insufficient sewerage is the rule, is that of contamination of well waters by the contiguity of privies, etc. The subject has been mentioned in your reports, but my own observations have rendered my convictions on the subject very strong.

"A source of danger to the lives and property of the people of this state lies in the fact that, so far as my observation goes, almost all of the kerosene sold in Wisconsin is below the standard required by law (110° Fah. fire test), and is, outside of that fact, of an explosive character. Out of ten samples tested by me, all of which were obtained from different sources, only one came up to the required standard, the worst taking fire at 31° below the point named in the statute. Many dealers are, no doubt, ignorant of the dangerous character of the article they sell; and no one can tell from the appearance of the sample of kerosene whether it is safe to use or not,* and for that reason a properly qualified inspector should be appointed, with power to test all oil offered for sale in the state."

Retreat sends the following through Dr. S. A. Mellen: "In answer to your circular I have to report that the amount and type of sickness in this vicinity is about the same as usual, being bilious fevers, intermittents and remittents, neuralgia, rheumatism, bowel troubles in summer and lung difficulties in the winter; all are of mild type and yield readily to the usual remedies. Generally they are not preventable; some few cases are brought on, doubtless, or

* Other things being equal, the oil which has the greatest specific gravity is to be preferred. Thus of two samples of a gallon each, one weighing six and the other seven pounds, the latter would, in all probability, be the safer for general use. Prof. Hindley touches a point on which the people are vitally interested.

aggravated by carelessness. In one family within my observation, sickness occurred by using water from what is called a pond hereabouts; a hole is scooped in the ground, puddled with clay and allowed to fill with water from the rain and melting snow; these ponds are intended for watering stock. The cistern belonging to the family I speak of caved in and its members used water from the pond, which was in the stable yard; horses, cattle, pigs and people helped themselves at will. As a consequence, the whole family became sick except one young man who worked elsewhere and came home only on Sunday. When the use of this water was left off the patients recovered.

"Another family of five persons contracted fever from the use of surface water drawn from a cistern, into which it had found its way from an undrained cellar; the fever soon took on a typhoid character, and was intractable until the cause was removed. There was formerly much sickness arising from the use of water from badly constructed cisterns, but people now are beginning to understand the matter, and are building them of stone and cement, thus rendering them safe.

"We had a small epidemic of scarlet fever extending over a triangular tract of country of about five miles in length of base and about three miles in altitude. I think the circulars issued by your board were of service in giving a good idea of the proper treatment and showing how the spread of the disease might be prevented; people would visit the sick, however, and attend funerals."

From *Richland Centre*, Dr. H. J. Wall writes as follows: "The diseases most prevalent have been scarlatina, diphtheria, or cynanche maligna, measles, small-pox, and the various types of intermittent fever. All these, as a rule, have been more than usually intense, and attended by a more than the usual rate of mortality, owing directly to a markedly depraved condition of the blood, which has been a more or less prominent feature in every case that has come under my notice. The cases which were particularly intense were traceable to impure water, ill-ventilated and dirty cellars, in some cases amounting to veritable cess-pools; and proximity

to streams where the overflow has been frequent and extensive, accompanied by an unusually high temperature. This locality (Pine River Valley) is subject to diseases of malarial origin, arising from the presence of numerous dams in the course of the river. A greater attention to the condition of the sources of water supply, to drainage and to the cleanliness and ventilation of cellars would undoubtedly have mitigated, or entirely prevented, many of the worst cases of disease in our midst."

Another communication from the same place by Dr. A. W. Bickford says: "Since the middle of summer malarial fever and ague have been very prevalent. We have also had variola, scarlatina and diphtheria; much sickness might have been prevented by drainage, cleanliness and better sanitation generally. Four cases of cerebro-spinal meningitis occurred in two families where the cellars were wet; in fact, water stood in both all winter, which undoubtedly was the cause of the disease; all four cases were fatal."

From *St. Martin* we have received the following from Dr. T. C. Malone: "The prevalent diseases here are bilious and intermittent fevers, bronchial and lung troubles, with a few cases of scarlet fever, diphtheria and measles, mostly of a mild character.

"In September, 1878, typhoid fever of a severe type appeared in a family of nine children, all of whom were down with it within three weeks. The house was small and poorly ventilated; the barn and barn yard were near the house, and the well from which water was taken for house use was very near to the barn yard; the water from the well seemed good, but was not tested in any way. All the conditions about the house were favorable to the development of disease, and the family assured me that they had been the same for ten years, during which time all had enjoyed good health.

"Diphtheria in one family assumed a very malignant form, although there were no other cases in the neighborhood; I could find nothing on the premises to account for the outbreak except the water used for cooking and drinking; this was drawn from a well near the house and I believe contained decaying animal matter;

the well was cleaned, without finding anything to substantiate this belief, but the unpleasant odor and taste were removed from the water."

We have received several valuable communiations from *Theresa*, by Dr. H. P. Wenzel, giving a large amount of interesting information, which we regret that we are unable to print at length. We condense from them the following summary:

"Small-pox was imported by a cattle buyer from Milwaukee, in December, 1877. Three of the family where he stopped were taken sick within a week; the whole family were vaccinated and the house quarantined against ingress or egress; the disease was stamped out. The remaining members of the family had only light febrile attacks; there were no deaths.

"Diphtheria prevailed fromSeptember, 1877, to April, 1878. In the beginning it was very virulent; undoubtedly the filthy surroundings of houses and yards was the cause of this; toward the last of the epidemic, the disorder was very mild and physicians did not see half the cases. There was an unusual prevalence of tonsillitis; erysipelas occurred in a very severe form, patients making slow recoveries. Acute diarrhœa in adults and inflammation of the bowels in children were moderately severe, but few deaths resulted.

"Thorough sanitary regulations, strictly enforced, against filth, etc., will certainly stamp diphtheria out of existence. My first attention in all cases of this disease was directed to cleanliness, then to isolation and ventilation; these, punctually carried out, mitigated the disorder in every instance. Four cases occurred in one family, the two first proving rapidly fatal, the others recovering; the virulence of the disorder in the first was due to the filthiness of the house and its surroundings, while the recovery of the others was owing in great part to a thorough cleansing of the premises, and the profuse employment of fresh whitewash.

"Two children in one family were taken sick with a severe form of typhoid fever, both being typical cases of the disease. They live on a hill containing about 120 acres, a large marsh lying on three sides. The hill is drift, humus about 18 inches, then great

Extracts from Special Correspondence.

and small boulders; the house stands at the top of the hill, about 35 yards from the marsh on the west; it contains three rooms below, cellar beneath and garret above; is built of logs and plastered inside; the cellar is ventilated, dry and clean, the surroundings of the house neat, and the family tidy. There is no privy on the premises. I believe the disease here to be due to the impurity of the water used; it is obtained from a spring at the foot of the hill, about a foot above the margin of the marsh and 20 feet from stagnant water, which was covered during a part of the summer and fall with a green fungus, and had a very peculiar odor; there is no chance for washings to enter the spring except by percolation, which the soil facilitates by its porosity. I believe the contamination came from the marsh, and that some malaria also was connected with the outbreak of the fever. The water tastes sweet, and is clear as crystal. My theory lies with the ground water, not with surface drainage.

"The principal sources of danger to health are filth, stagnant water, impure water, imperfect drainage, faulty sinks, shallow and foul privies, damp houses, foul, unventilated and damp cellars, and the saturation of the soil around dwellings with excrementitious matters. Some lands have been drained, and a better condition of health is apparently the result. The mill dam at this place backs Rock river for miles, and all persons taken sick in proximity to it have a severe type of disease. I do not think, however, that it has *produced* any special disease, but closer investigation is necessary to determine this point."

From *Waupaca*, Dr. G. R. Taylor writes: "Our county, at least this part of it, has been very free from any epidemic disease.

"Consumption prevails largely among the Norwegians — seldom among the Germans. The only source of danger to the health of our citizens that is apparent at present, is the close proximity of privies and wells; in many instances they are not more than from *six to ten feet apart!* The soil being sandy all fluids pass rapidly through it, and must of necessity enter the wells; the only reason that all of our wells are not already contaminated, is that the soil has not yet become surcharged with filth; its doing so is only a

question of time and population. I have called public attention to this subject, but fear that it will require a visitation such as has just passed over the south to cause the people to heed any admonition."

From *Watertown*, Dr. R. M. Wigginton writes: "The amount of sickness here is small and the type mild. One case of diphtheria was clearly traced to decomposing vegetables in the cellar; the principal danger to health comes from the want of proper drainage and sewerage."

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